

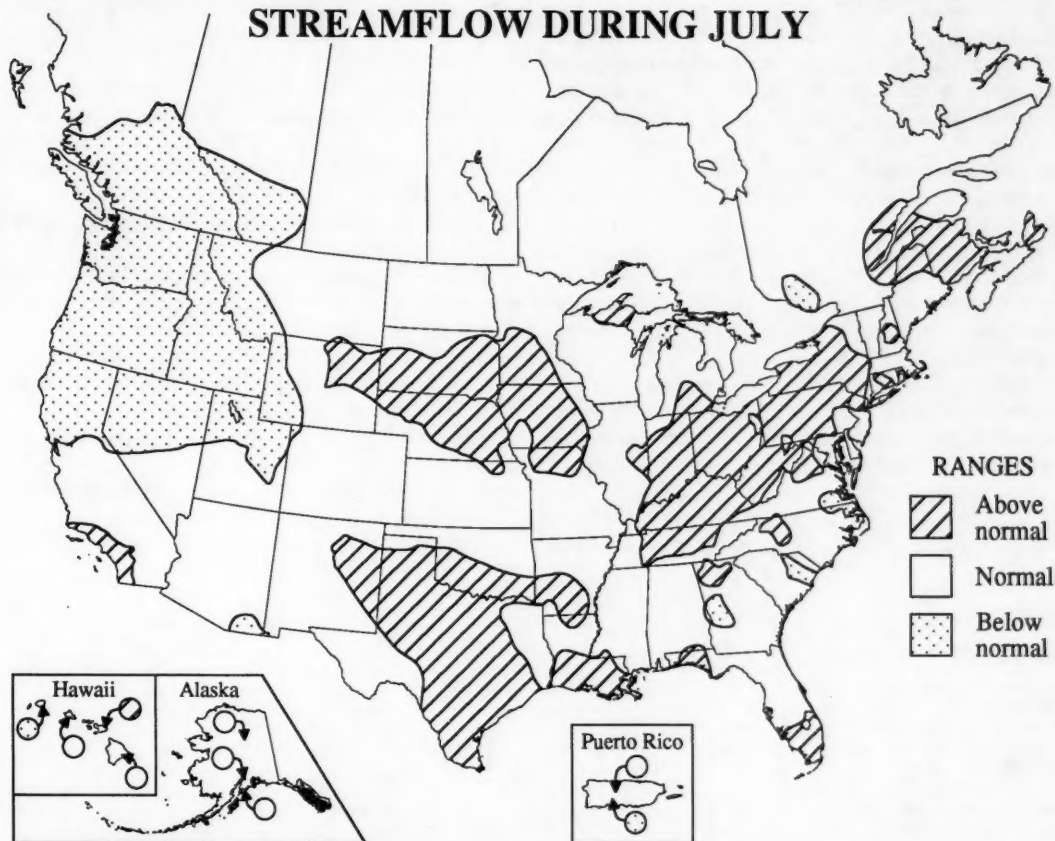
National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

JULY 1992

STREAMFLOW DURING JULY



Drought continues to affect both the Pacific Northwest and California. Significant relief is unlikely to occur until next water year since the time of peak runoff has passed in both areas.

On July 24, widespread thunderstorms over southeastern Kentucky caused flash flooding in Clay County near Manchester, resulting in the deaths of a woman and three children.

July streamflow decreased from that for June at 125 index stations, remained the same at 4 index stations, and increased at 63 index stations, resulting in normal to above-normal range streamflow at 72 percent of the 192 reporting index stations in the United States, southern Canada, and Puerto Rico during the month.

Below-normal range streamflow occurred in 19 percent of the area of the conterminous United States and southern Canada during July, compared with 36 percent during June. Total flow during June for the 174 reporting index stations in the conterminous United States and southern Canada was 4 percent above median, 20 percent less than last month, and 1 percent more than flow during July 1991. This was only the second month of above-median flow for the water year, the first one having been in October.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged about 8 percent below median but in the normal range, despite a 12 percent decrease in flow from June to July. Flow of the St. Lawrence River was in the normal range for the 14th consecutive month. Flow of the Mississippi River was in the normal range for the second consecutive month. Flow of the Columbia River was in the below-normal range for the third consecutive month.

Month-end index reservoir contents were in the below-average range at 31 of 100 reporting sites, compared with 31 of 100 at the end of June. Two reservoirs had no usable storage—Lake Tahoe and Rye Patch—while two other reservoirs had contents below 10 percent of normal maximum near the end of the month—John Martin and Pine Flat.

Mean July elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were in the normal range but below median except on Lake Erie. Levels rose from those for June except on Lake Ontario.

Utah's Great Salt Lake fell 0.40 foot, ending the month at 4,200.90 feet above National Geodetic Vertical Datum. Lake level was 2.40 feet lower than at the end of July 1991, and 10.95 feet lower than the maximum of record.

Streamflow increased from that for June in the St. Lawrence River, Upper Mississippi River, Missouri River, and Ohio River basins, and decreased in the other eight basins. Streamflow was below median in the Hudson Bay, Colorado River, Great and other closed, Pacific Slope, and Columbia River basins, and above median in the other seven basins.

SURFACE-WATER CONDITIONS DURING JULY 1992

Drought continues to affect both the Pacific Northwest and California. Significant relief is unlikely to occur until next water year since the time of peak runoff has passed in both areas. Station location maps and graphs showing hydrologic conditions for the Pacific Northwest and California are on pages 6-11.

On July 24, about 2.5 inches of rain from widespread thunderstorms over southeastern Kentucky fell in 1 hour, causing flash flooding in Clay County near Manchester. The highly localized rainfall caused Bear Creek (drainage area about 10 square miles) to flood, resulting in the deaths of a woman and three children. Another child survived by holding onto a tree limb until help arrived. Eleven homes were destroyed and 15 families were left homeless. Most of the damage occurred in the upper end of the basin where logging had recently occurred. Nearby streamflow stations on Red Bird River and Goose Creek at Manchester (drainage area of over 150 square miles) had peak discharges with recurrence intervals of less than 2 years. Bear Creek is a tributary to Red Bird River in the South Fork Kentucky River basin.

July was one of the wettest on record in the Wind River basin in Wyoming, with much above-average precipitation of 2.07 inches recorded (the normal is 0.78 inches). Following a minimal snowmelt runoff and a grim prognosis for water supply, the rain was welcomed by the farmers, who had difficulty trying to harvest hay and grain, and the irrigation districts, who were dealing with a severe water shortage.

July streamflow decreased from that for June at 125 index stations, remained the same at 4 index stations, and increased at 63

index stations, resulting in normal to above-normal range streamflow at 72 percent of the 192 reporting index stations in the United States, southern Canada, and Puerto Rico during the month, compared with 62 percent of stations in those ranges during June, and 72 percent of stations in those ranges during July 1991.

Below-normal range streamflow occurred in 19 percent of the area of the conterminous United States and southern Canada during July, compared with 36 percent during June, and 24 percent (revised) during July 1991. Total flow of 653,800 cubic feet per second (ft³/s) during July for the 174 reporting index stations in the conterminous United States and southern Canada was 4 percent above median, 20 percent less than last month, and 1 percent more than flow during July 1991. This was the third month of above-median flow for the water year, the others having been in October and December.

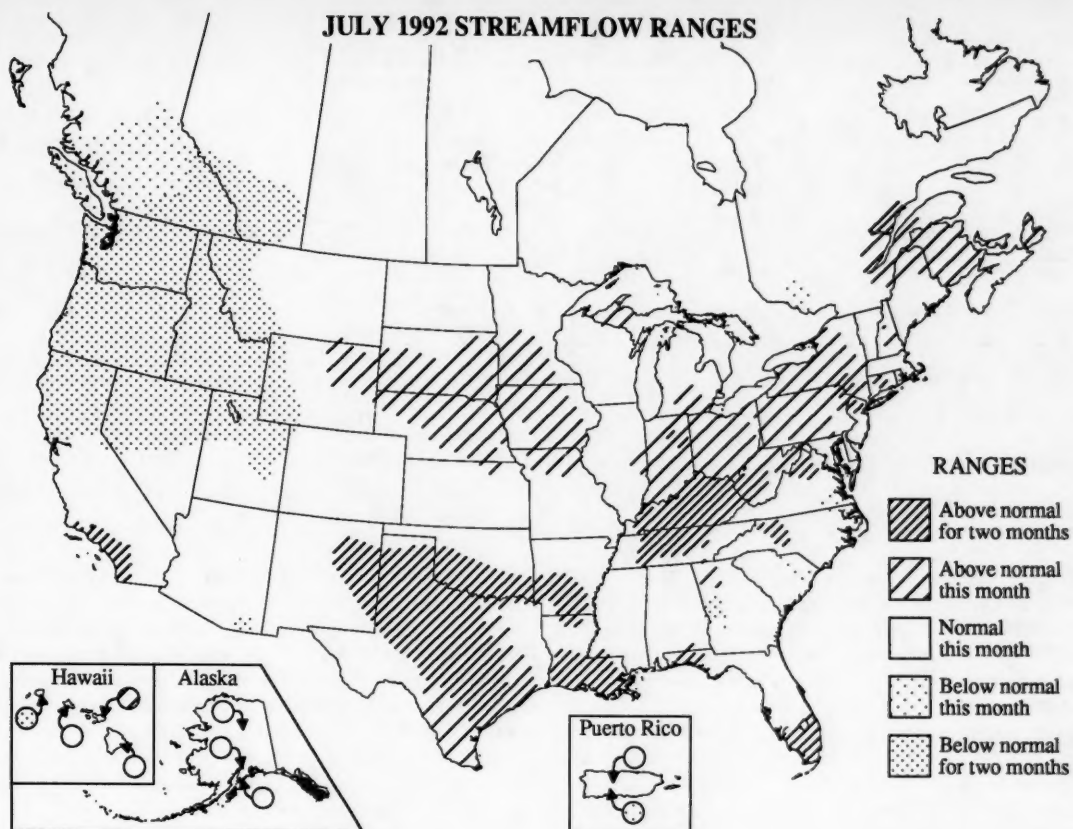
New July extremes occurred at 6 index stations (see table on page 4)—2 new minimums (both at stations in Oregon) and 4 new maximums (at stations in Ohio, Indiana, and Kansas)—compared with 7 new minimums and 2 new maximums during June. Hydrographs for the stations at which new extremes occurred are on page 5. Also on page 5 is the hydrograph for the Rainy River at Manitou Rapids, Minnesota, where streamflow has been in the normal range for nine consecutive months.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 893,100 ft³/s, about 8 percent below median but in the normal range, despite a 12 percent decrease in flow from June to July. Flow of the St.

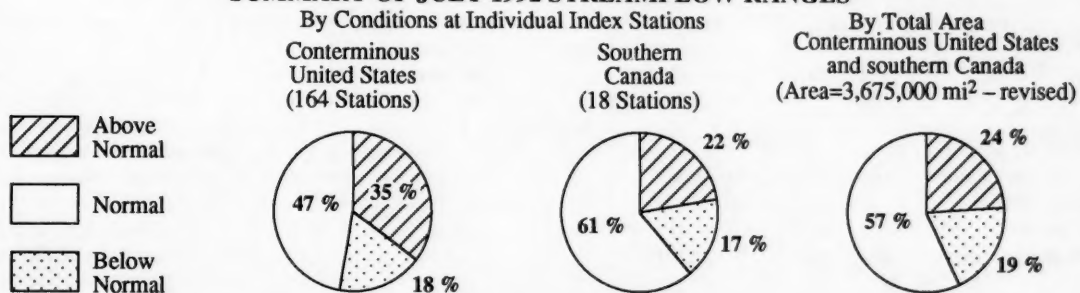
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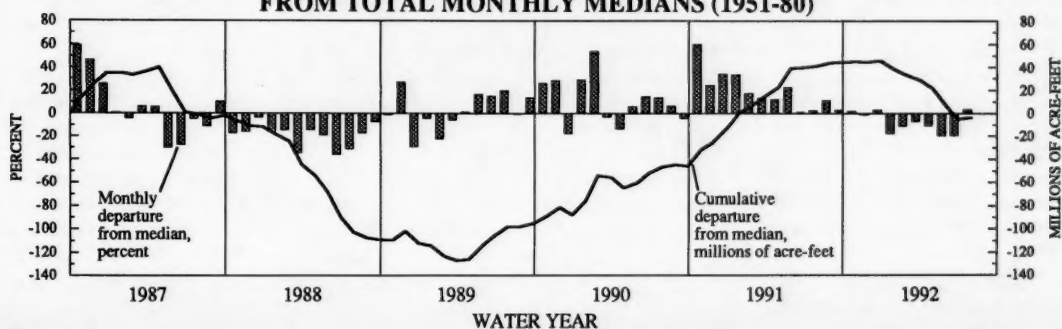
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SUMMARY OF JULY 1992 STREAMFLOW RANGES



MONTHLY AND CUMULATIVE DEPARTURE OF TOTAL MONTHLY MEANS FROM TOTAL MONTHLY MEDIANS (1951-80)



NEW EXTREMES DURING JULY 1992 AT STREAMFLOW INDEX STATIONS

Station number	Stream and place of determination	Drainage area (square miles)	Years of record	Previous July extremes (period of record)		July 1992			Day
				Monthly mean in cfs (year)	Daily mean in cfs (year)	Monthly mean in cfs	Percent of median	Daily mean in cfs	
LOW FLOWS									
14191000	Willamette River (adjusted) at Salem, Oregon	7,280	75	3,286 (1940)	3,040 (1940)	3,081	56	5,480	17
14301500	Wilson River near Tillamook, Oregon	161	61	78.9 (1967)	57.0 (1967)	78.0	57	50.0	30
HIGH FLOWS									
3234500	Scioto River at Higby, Ohio	5,131	61	10,310 (1958)	29,000 (1958)	11,446	680	25,400	*
3326500	Mississinewa River at Marion, Indiana	682	68	2,159 (1962)	14,700 (1962)	2,788	1,515	17,800	15
4193500	Maumee River at Waterville, Ohio	6,330	69	9,910 (1943)	29,800 (1986)	11,307	842	34,800	17
6884400	Little Blue River near Barnes, Kansas	3,324	33	3,155 (1958)	14,100 (1982)	5,540	1,371	37,900	26

* Occurred more than once

12 percent decrease in flow from June to July. Flow of the St. Lawrence River was in the normal range for the 14th consecutive month. Flow of the Mississippi River was in the normal range for the second consecutive month after two months in the below-normal range. Flow of the Columbia River was in the below-normal range for the third consecutive month, after three months in the normal range. Hydrographs for both the combined and individual flows of the "Big 3" and dissolved solids and water temperatures at four large river stations are on page 12. Flow data for the "Big 3" and 42 other large rivers are given in the Flow of Large Rivers table on page 13.

Month-end index reservoir contents were in the below-average range (below the month-end average for the period of record by more than 5 percent of normal maximum contents) at 31 of 100 reporting sites, compared with 31 of 100 at the end of June, and 37 of 100 at the end of July 1991, including most reservoirs in Nova Scotia, Maryland, Nebraska, the Dakotas, Montana, Wyoming, Colorado, Utah, Idaho, Nevada, California and the Colorado River Storage Project. Contents were in the above-average range at 35 reservoirs (compared with 31 last month, and 32 a year ago), including most reservoirs in Maine, Massachusetts, the Carolinas, the Tennessee Valley, Alabama, Oklahoma, Texas, New Mexico, and Arizona. Reservoirs with contents in the below-average range and significantly lower than last year (with normal maximum contents of at least 1,000,000 acre-feet) are: Canyon Ferry Fort Peck, and Hungry Horse, Montana; Boise River, Idaho; Upper Snake River system, Idaho-Wyoming; the Pathfinder system, Wyoming; Bear Lake, Idaho-Utah; Ross, Washington; and also Folsom, Pine Flat, Clair Engle, Lake Berryessa, and Shasta Lake in California. Two reservoirs had no usable storage (July average in parentheses): Lake Tahoe (68), California-Nevada, for the 22nd consecutive month, and Rye Patch (62), Nevada, for the 3rd consecutive month. Two other reservoirs had contents below 10 percent of normal maximum near the end of the month (July average in parentheses): John Martin, 5 percent (22), Colorado; and Pine Flat, 7 percent (52), California. Graphs of contents for seven reservoirs are shown on page 12 with contents for the 100 reporting reservoirs given on page 13. Reservoir storage conditions near the end of July 1992 and July 1991 are shown on streamflow maps on page 15.

Mean July elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were in the normal range

but below median except on Lake Erie. Levels rose from those for June except on Lake Ontario. July levels at four master gages on the Great Lakes ranged from 0.46 foot higher (Lake Superior) to 0.17 foot lower (Lake Ontario) than those for June. Monthly means have now been in the normal range for 10 months on Lake Superior, 26 months on Lake Huron, 16 months on Lake Erie, and 3 months on Lake Ontario. July 1992 levels ranged from 0.13 foot (Lake Superior) to 0.37 foot lower (Lake Huron), than those for July 1991. Stage hydrographs for the master gages on Lake Superior, Lake Huron, Lake Erie, and Lake Ontario are on page 16.

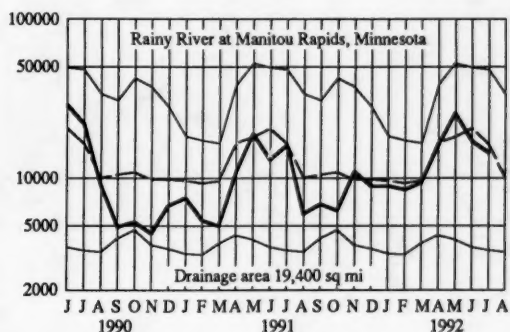
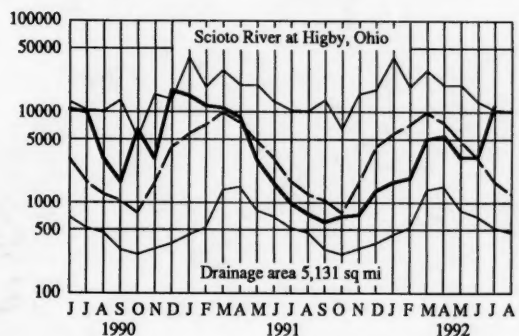
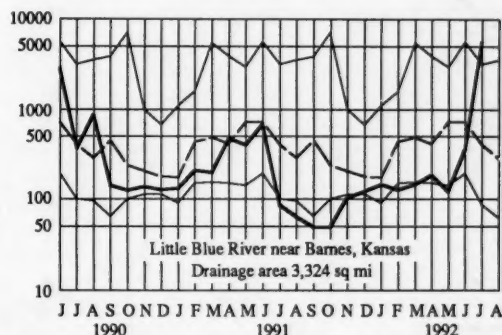
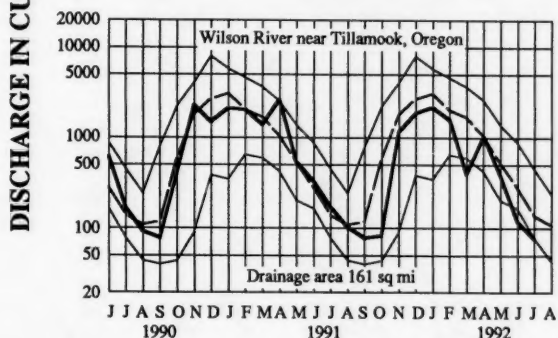
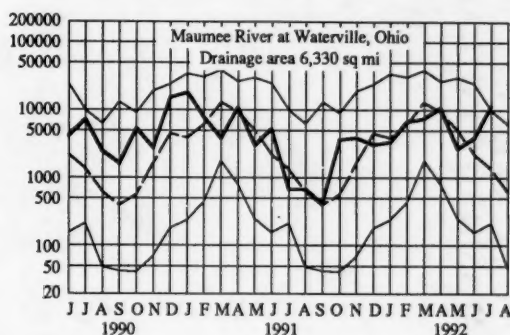
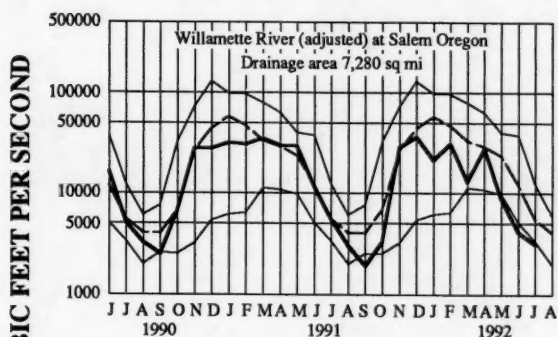
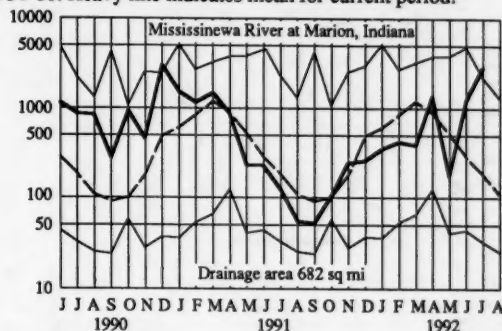
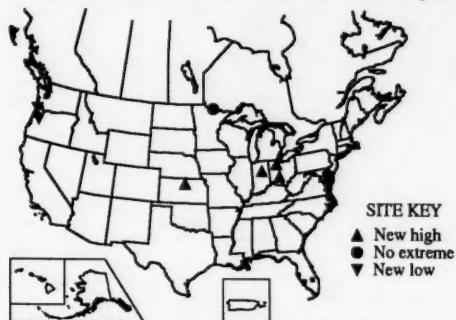
Utah's Great Salt Lake (graph on page 16) fell 0.40 foot, ending the month at 4,200.90 feet above National Geodetic Vertical Datum. Lake level was 2.40 feet lower than at the end of July 1991, and 10.95 feet lower than the maximum of record which occurred in June 1986 and March-April 1987.

Maps on page 17 show streamflow conditions during July 1992 and July 1991. July 1992 has about 50 percent more area in the above-normal range, about 21 percent less area in the below-normal range, and about 5 percent less area in the normal range than July 1991. Below-normal range streamflow occurred during both months in parts of California, Nevada, Utah, Colorado, Oregon, Idaho, Wyoming, Arizona, New Mexico, North Carolina, Virginia, New York, and Quebec. Above-normal range streamflow occurred during both months in parts of New Mexico, Colorado, Wyoming, Nebraska, South Dakota, Minnesota, Iowa, Michigan, Wisconsin, Louisiana, Mississippi, Alabama, Georgia, Florida, North Carolina, and Virginia. Both maps also show reservoir storage near the end of the month at all reporting index reservoir stations for comparison with streamflow.

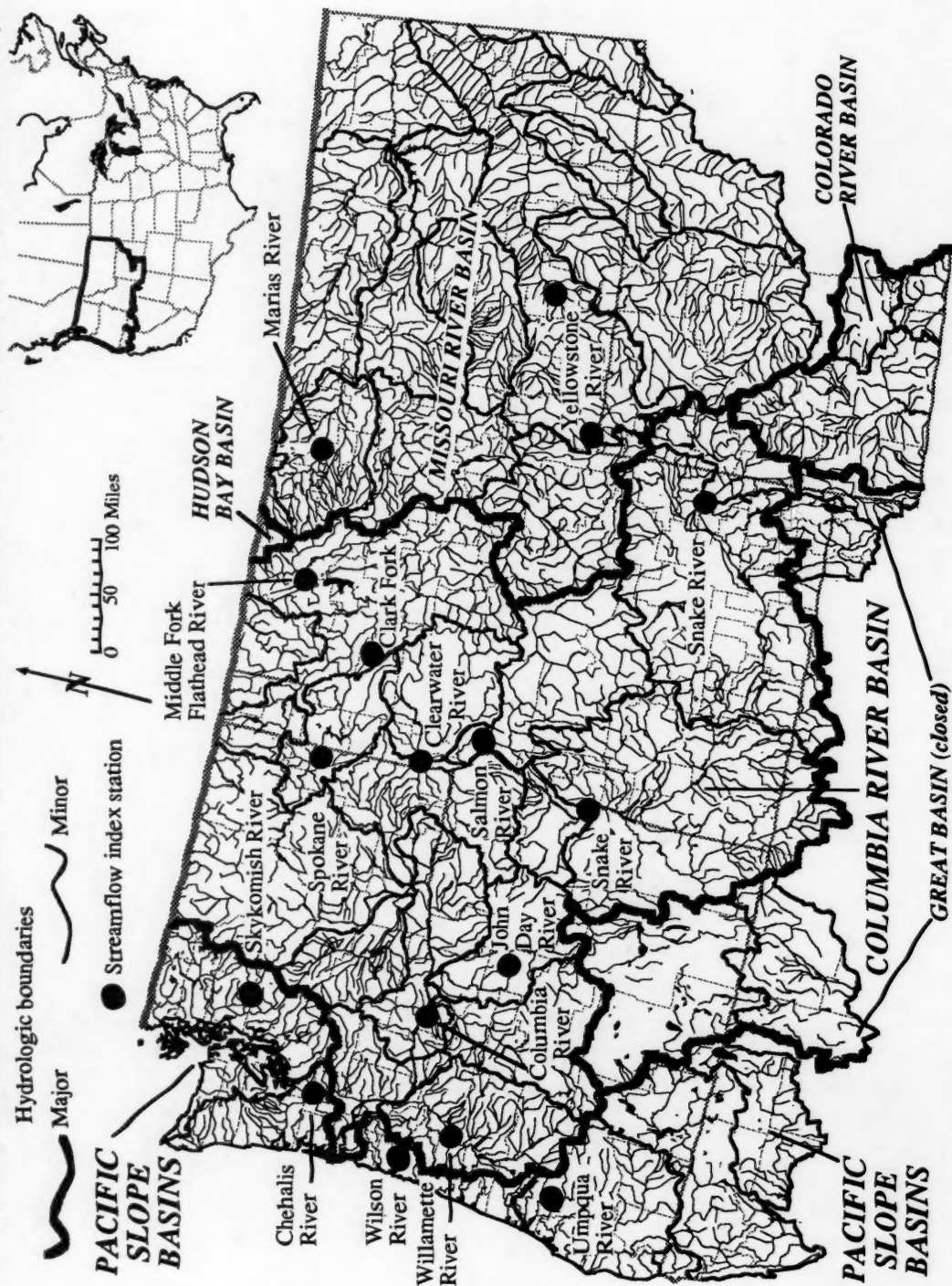
Graphs for 12 hydrologic areas compare monthly streamflow for the 1991 and 1992 water years with median monthly streamflow for 1951-80 (page 18) and also show (page 19) monthly percent departure of streamflow from median for the 1987-92 water years. Streamflow increased from that for June in the St. Lawrence River, Upper Mississippi River, Missouri River, and Ohio River basins, and decreased in the other eight basins. Streamflow was below median in the Hudson Bay, Colorado River, Great and other closed, Pacific Slope, and Columbia River basins, and above median in the other seven basins.

MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.



LOCATION OF NATIONAL WATER CONDITIONS STREAMFLOW INDEX STATIONS IN THE PACIFIC NORTHWEST (OREGON, WASHINGTON, IDAHO, AND MONTANA)



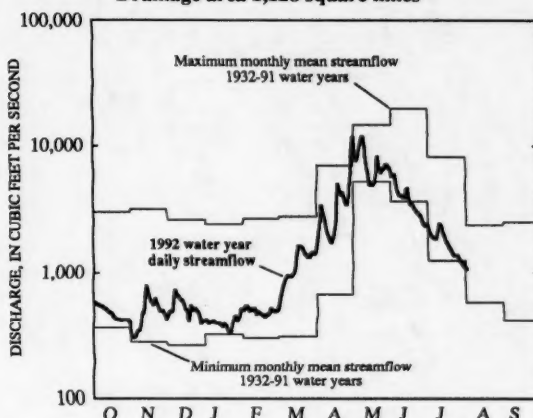
PACIFIC NORTHWEST (OREGON, WASHINGTON, IDAHO, AND MONTANA) HYDROLOGIC CONDITIONS

Continued dry weather in Idaho, Oregon, and Washington removed all moisture from forest fuel, which resulted in many forest and rangeland fires in the three States. Over 3,000 firefighters were trying to control major fires in Oregon and Washington. Dozens of homes were destroyed by fires in the Rogue River and Klamath Falls areas of Oregon, and near Klickitat in Washington.

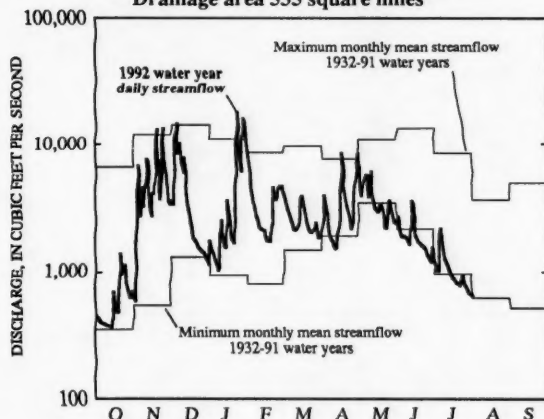
Low flows caused by the drought have created some bizarre situations. The former town of Kosmos, Washington, is normally inundated by water stored behind Mossyrock Dam in Lewis County. The old townsite is sometimes exposed in winter when the reservoir is drawn down to provide flood storage; however, because of inclement weather, no one prowls around the townsite. This summer, curious visitors are exploring the site and are finding a host of environmental problems associated with underground storage of oil. A 4,000-gallon tank of oil was found by a local resident and classified as dangerous by the State, according to the *Tacoma News Tribune*. It is estimated that thousands of dollars will need to be spent cleaning up the old townsite to eliminate potential contamination of water in the reservoir.

Water-use restrictions will continue in Seattle and Tacoma, Washington, and also Portland, Oregon, until at least September. Low flows of some streams in Oregon are approaching minimum in-stream flow for dilution of waste effluent from industrial and municipal sources. County officials in Clackamas and Multnomah Counties in Oregon applied for drought emergency declaration from the State. Clackamas County was the first Oregon County west of the Cascades Mountains to be granted a drought declaration. The governor of Oregon requested that the Secretary of Agriculture declare a Federal drought emergency in five counties.

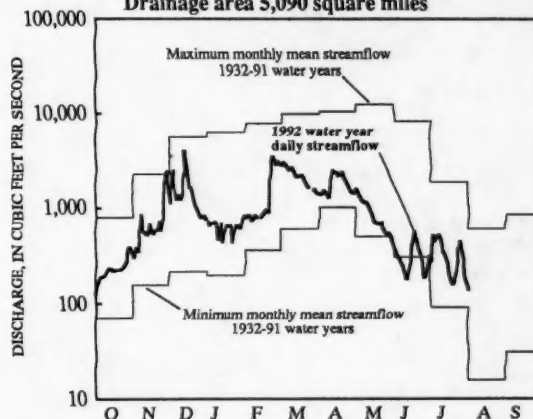
Middle Fork Flathead River near West Glacier, Montana
Drainage area 1,128 square miles



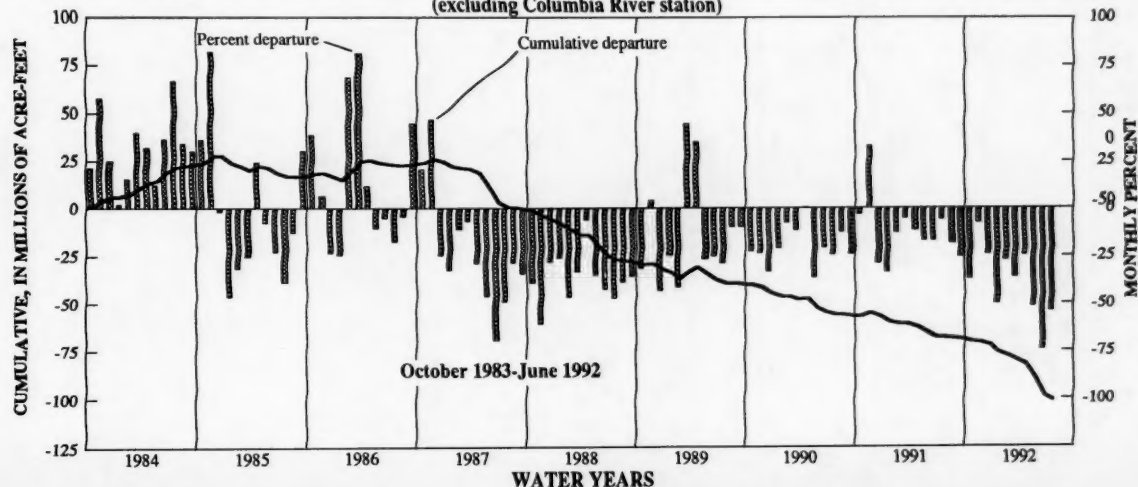
Skykomish River near Goldbar, Washington
Drainage area 535 square miles



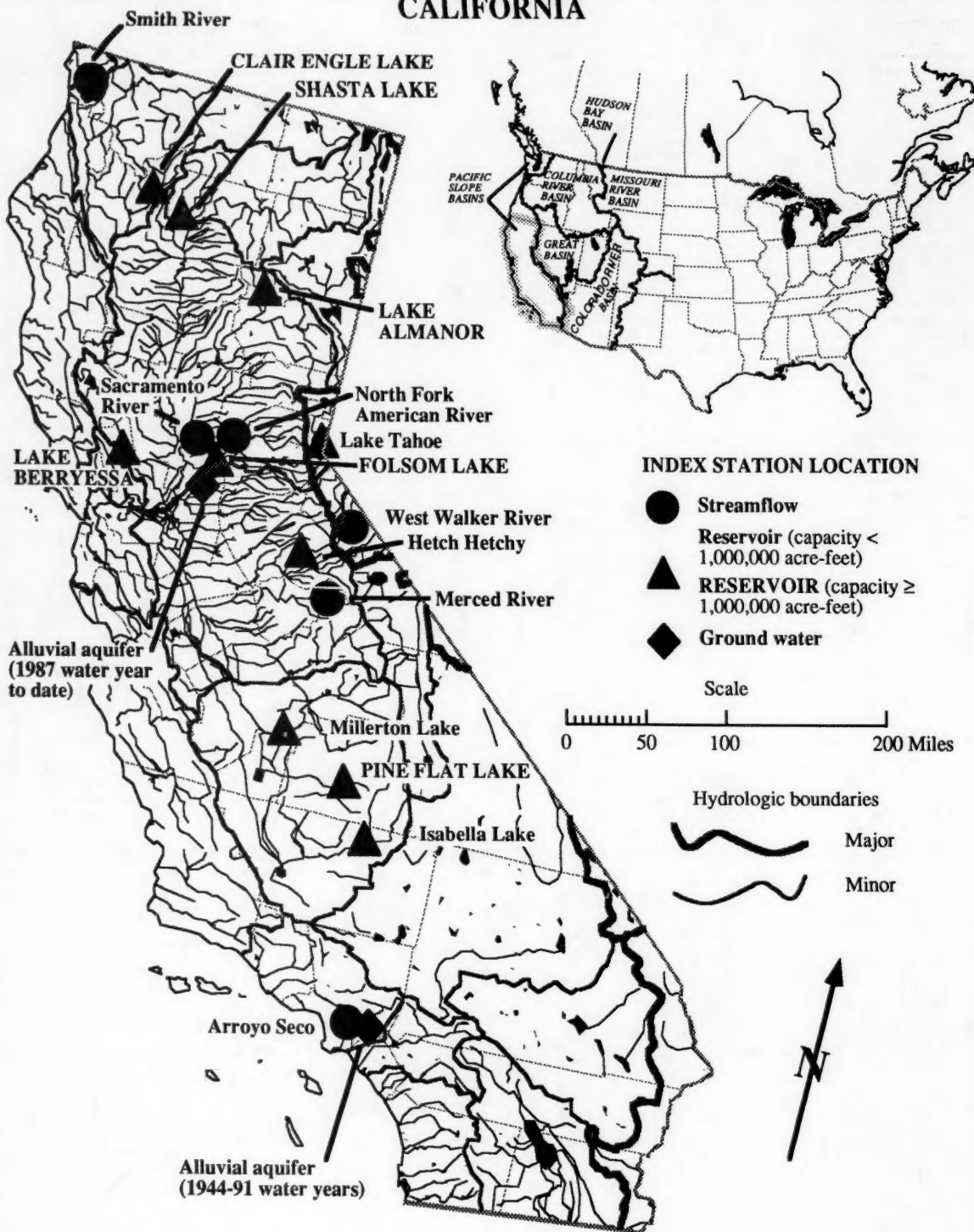
John Day River at Service Creek, Oregon
Drainage area 5,090 square miles



DEPARTURE FROM TOTAL MEDIAN MONTHLY STREAMFLOW AT THIRTEEN PACIFIC SLOPE BASINS INDEX STATIONS
(excluding Columbia River station)



LOCATION OF NATIONAL WATER CONDITIONS INDEX STATIONS IN CALIFORNIA

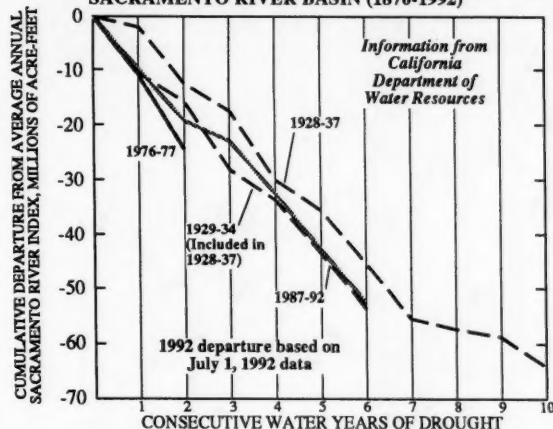


CALIFORNIA HYDROLOGIC CONDITIONS

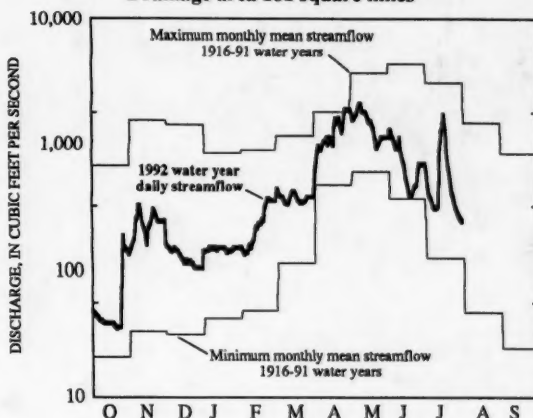
Streamflow, reservoir storage, and ground-water levels continue to decline in most of California. According to the *California Water Supply Outlook* (California Department of Water Resources) storage in 155 major reservoirs (Statewide) was at only about 58 percent of the average for the end of July and about 9 percent below that of a year ago. In the major Central Valley reservoirs, storage was about 49 percent of the average for the end of July and about 7 percent below that of a year ago. Precipitation for the water year to date for selected stations ranged from a low of about 58 percent of normal (at Eureka in the northwestern part of the State) to about 197 percent of normal at Blythe (in the southwestern part of the State). Precipitation was generally at about normal in the central part of the State, decreasing to the north and increasing to the south. The drought comparison based on the Sacramento River Index (where the flow estimate has remained unchanged since July 1) indicates the severity of the present drought.

With the season of major precipitation over and snowmelt ended, little relief is in sight until next water year. Data from U.S. Geological Survey index stations (graphs on this and the two following pages) compare present conditions with those of previous years. The daily streamflow graphs for the Merced River (west-central California) and the Smith River (northwestern California) and as the reservoir contents graphs on page 11 show the difference between conditions in the north and south. The overall picture, based on streamflow at the six index stations for which data are available since water year 1944, is that of the worst drought since World War II, reinforcing the information shown in the Sacramento River Index graph. The combined contents of six large index reservoirs (page 10) is about the same as that at the end of July 1991, while the water level in the Wilton well is about 3.1 feet lower than at the end of July 1991.

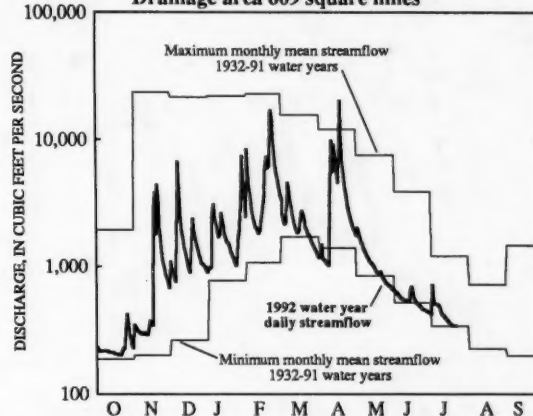
THE MOST SEVERE DROUGHTS IN CALIFORNIA'S SACRAMENTO RIVER BASIN (1870-1992)



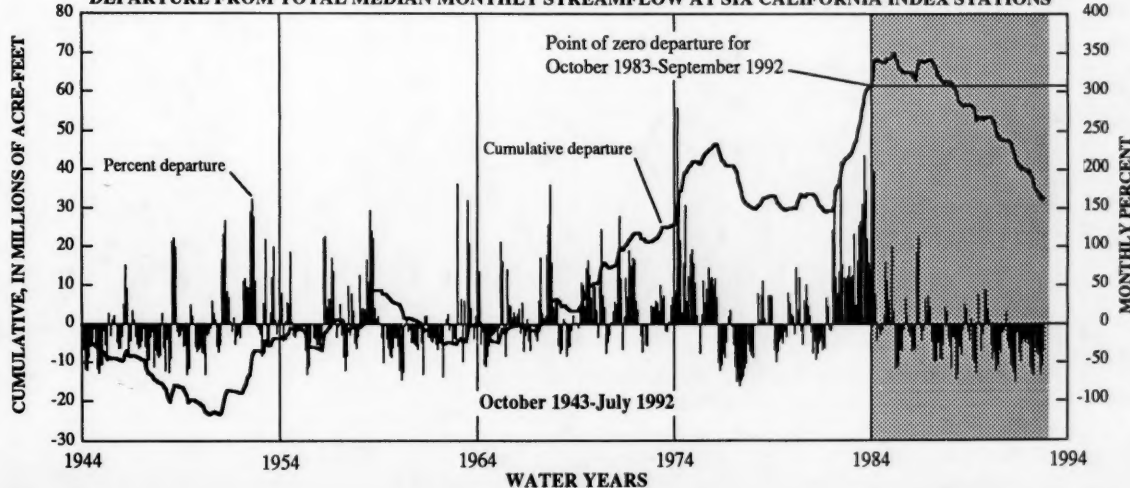
Merced River at Happy Isles Bridge, near Yosemite Drainage area 181 square miles



Smith River near Crescent City, California Drainage area 609 square miles

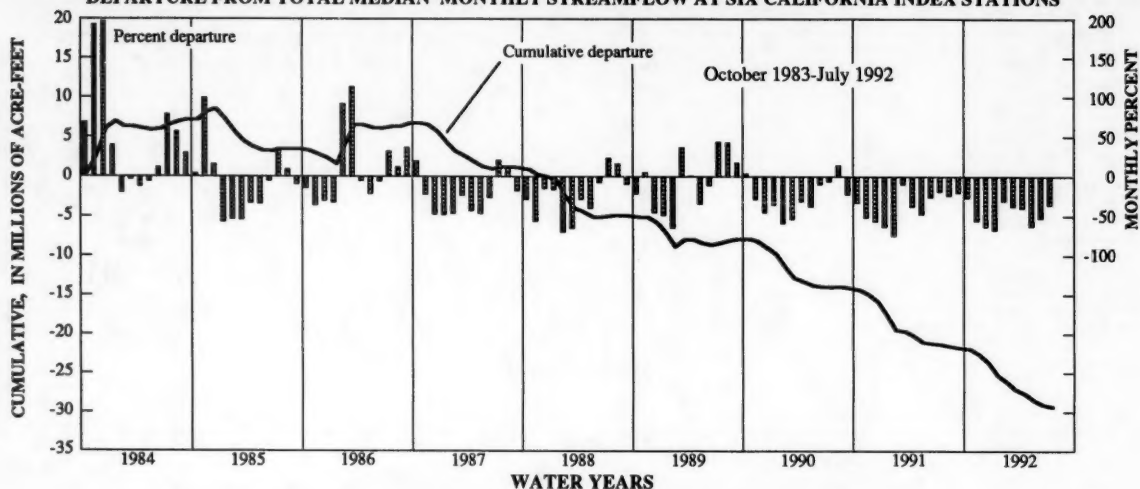


DEPARTURE FROM TOTAL MEDIAN MONTHLY STREAMFLOW AT SIX CALIFORNIA INDEX STATIONS

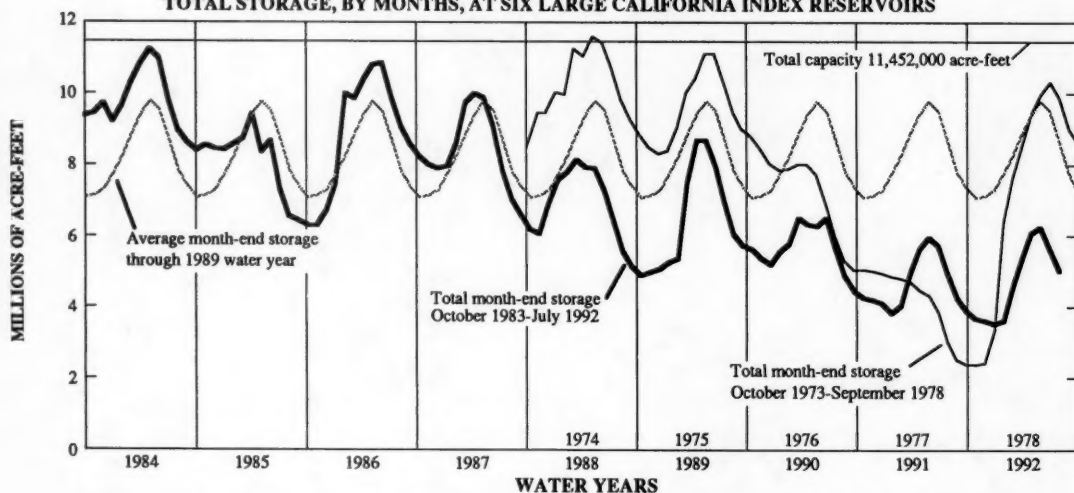


CALIFORNIA STREAMFLOW, COMBINED RESERVOIR CONTENTS, AND GROUND-WATER LEVELS

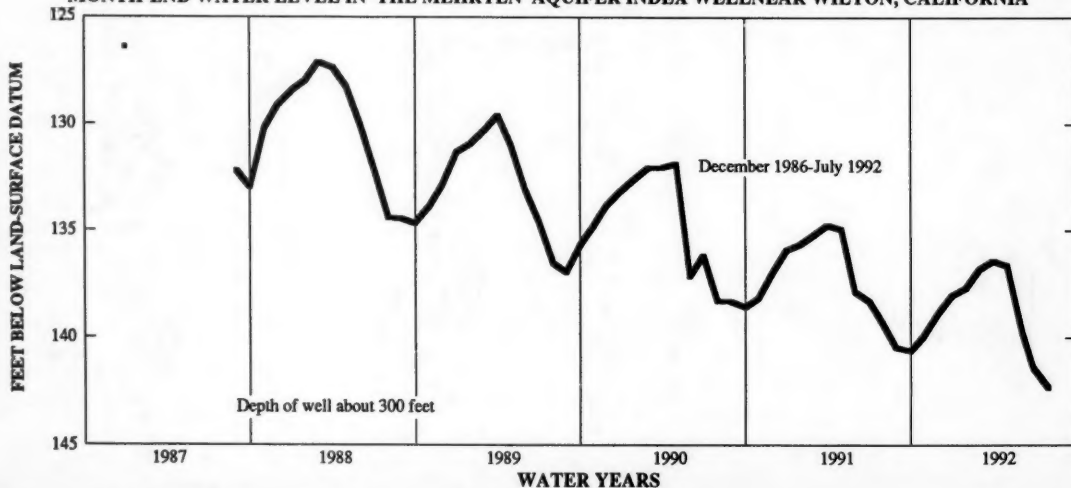
DEPARTURE FROM TOTAL MEDIAN MONTHLY STREAMFLOW AT SIX CALIFORNIA INDEX STATIONS



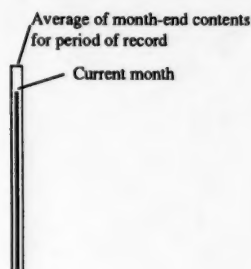
TOTAL STORAGE, BY MONTHS, AT SIX LARGE CALIFORNIA INDEX RESERVOIRS



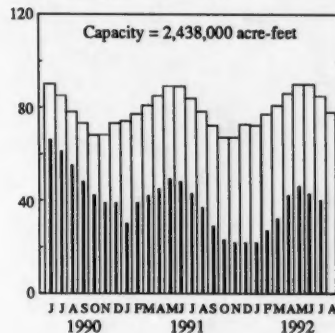
MONTH-END WATER LEVEL IN THE MEHRTEN AQUIFER INDEX WELL NEAR WILTON, CALIFORNIA



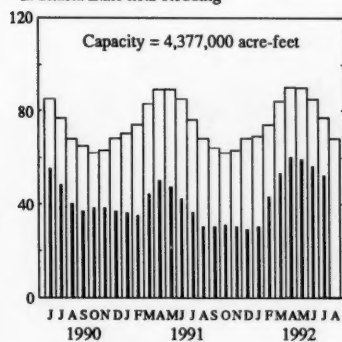
CALIFORNIA RESERVOIR INDEX STATIONS



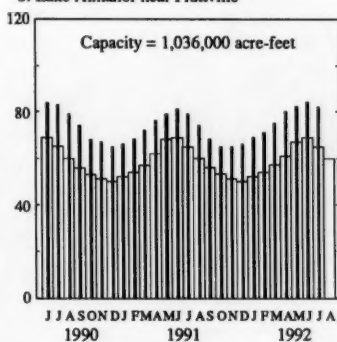
1. Clair Engle Lake near Lewiston



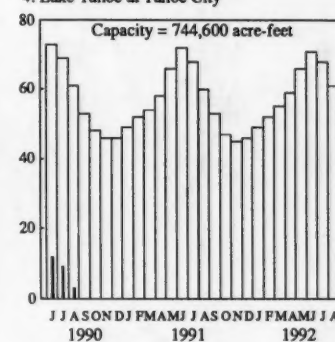
2. Shasta Lake near Redding



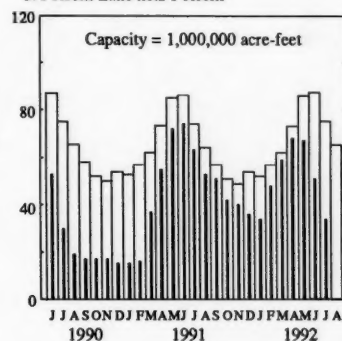
3. Lake Almanor near Prattville



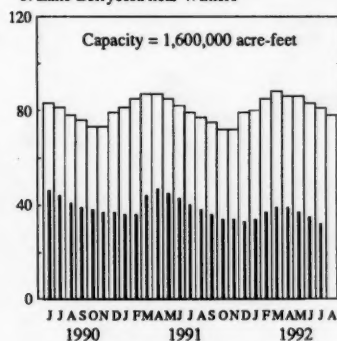
4. Lake Tahoe at Tahoe City



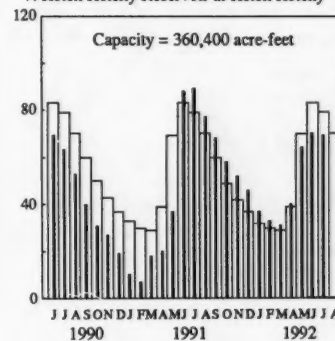
5. Folsom Lake near Folsom



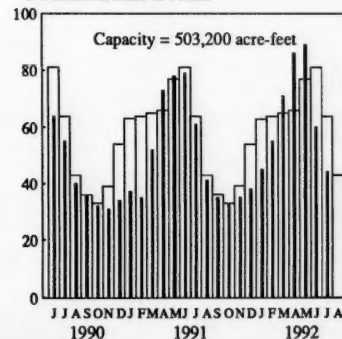
6. Lake Berryessa near Winters



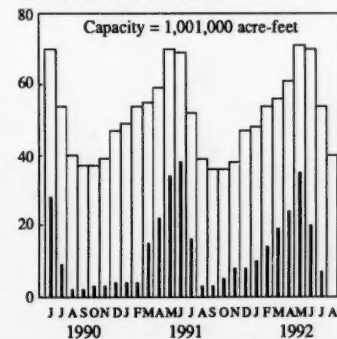
7. Hetch Hetchy Reservoir at Hetch Hetchy



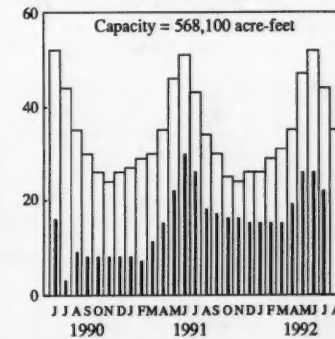
8. Millerton Lake at Friant



9. Pine Flat Lake near Piedra



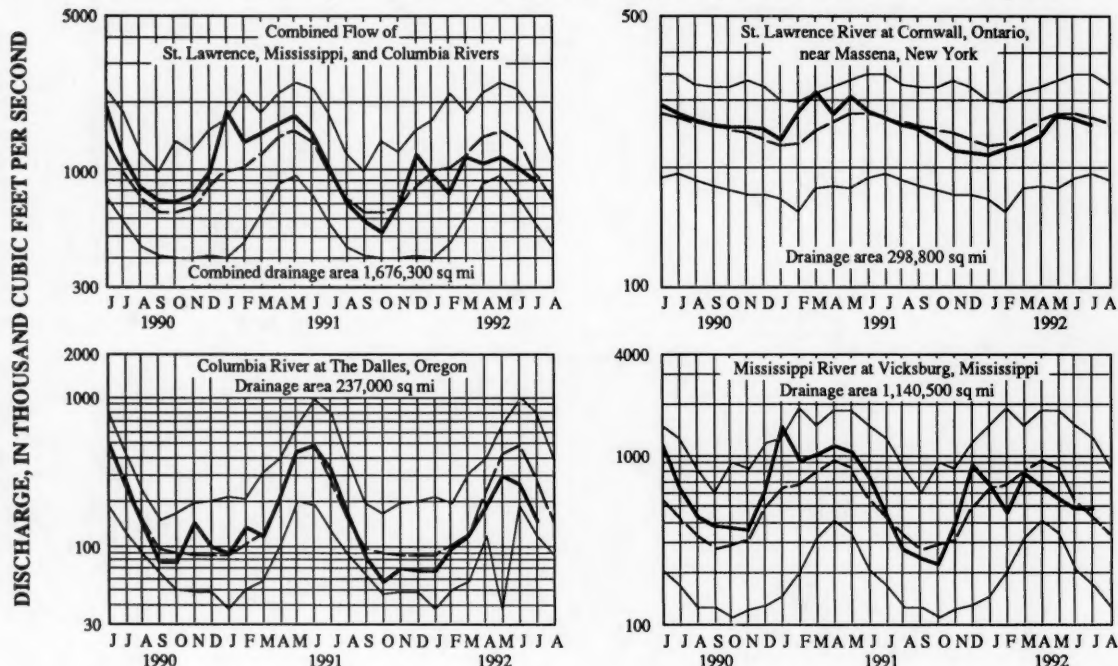
10. Isabella Lake near Lake Isabella



PERCENT OF NORMAL CAPACITY

HYDROGRAPHS FOR THE "BIG THREE" RIVERS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.



Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES, FOR JULY 1992, AT DOWNSTREAM SITES ON FIVE LARGE RIVERS

Station number	Station name	July data of following calendar years	Stream discharge during month (cfs)	Dissolved-solids concentration ¹		Dissolved-solids discharge ¹			Water temperature ²		
				Mini-mum (mg/L)	Maxi-mum (mg/L)	Mean (tons per day)	Mini-mum (tons per day)	Maxi-mum (tons per day)	Mean in °C	Mini-mum in °C	Maxi-mum in °C
01463500	Delaware River at Trenton, New Jersey, (Morrisville, Pennsylvania)	1992 1945-91 (Extreme yr)	6,240 6,699 44,822	102 57 (1947)	115 145 (1978)	1,831 32,095 (1965)	1,398 465 (1965)	2,503 16,700 (1969)	25.0 32.5 18.5	23.0 18.5	28.0 33.5
07289000	Mississippi River at Vicksburg, Mississippi	1992 1976-91 (Extreme yr)	484,400 499,200 4421,700	241 188 (1989)	260 330 (1988)	329,000 308,200 (1988)	258,900 114,000 (1988)	419,800 633,000 (1980)	27.5 25.5 23.5	24.5 23.5	29.0 34.5
03612500	Ohio River at lock and dam 53, near Grand Chain, Illinois, (streamflow station at Metropolis, Illinois)	1992 1955-91 (Extreme yr)	211,000 158,400 4143,700	141 124 (1965)	234 291 (1991)	...	53,700 23,700 (1988)	156,000 288,000 (1989)	...	23.5 16.5	25.5 31.0
06934500	Missouri River at Hermann, Missouri, (60 miles west of St. Louis, Missouri)	1992 1976-91 (Extreme yr)	109,300 92,210 475,690	248 201 (1981)	429 501 (1985)	98,100 87,950 (1977)	50,600 44,700 (1977)	214,000 208,000 (1984)	26.5 27.5	24.0 22.0	28.0 32.5
14128910	Columbia River at Oregon (streamflow station at The Dalles, Oregon)	1992 1976-91 (Extreme yr)	121,000 ... 4279,500	71 60 (1976)	158 93 (1977)	28,900 ...	19,400 12,500 (1977)	47,100 65,100 (1981)	20.5 ...	19.5 15.5	21.5 22.0

¹Dissolved-solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.

²To convert °C to °F: [(1.8 x °C) + 32] = °F.

³Mean for 8-year period (1983-91).

⁴Median of monthly values for 30-year reference period, water years 1951-80, for comparison with data for current month.

FLOW OF LARGE RIVERS DURING JULY 1992

Station number	Stream and place of determination	Drainage area (square miles)	Average discharge through September 1985 (cubic feet per second)	Monthly mean discharge (cubic feet per second)	Percent of median monthly discharge 1951-80	July 1992			Date
						Change in discharge from previous month (percent)	Discharge near end of month		
							Cubic feet per second	Million gallons per day	
01014000	St. John River below Fish River at Fort Kent, Maine...	5,665	9,758	* 13,740	297	47	9,900	6,400	31
01318500	Hudson River at Hadley, New York.....	1,664	2,908	1,150	111	-57	1,160	749	31
01357500	Mohawk River at Cohoes, New York.....	3,456	5,683	* 4,210	227	3	2,650	1,710	31
01463500	Delaware River at Trenton, New Jersey.....	6,780	11,670	6,240	129	-58	6,260	4,040	31
01570500	Susquehanna River at Harrisburg, Pennsylvania.....	24,100	34,340	* 18,370	155	-16	25,900	16,700	29
01646500	Potomac River near Washington, District of Columbia...	11,560	11,500	* 16,180	154	-36	...	...	...
02105500	Cape Fear River at William O. Huske Lock, near Tarheel, North Carolina.	4,852	5,002	2,101	108	-52	...	...	...
02131000	Pee Dee River at Pee Dee, South Carolina.....	8,830	9,871	4,244	75	-72	3,960	2,560	31
02226000	Altamaha River at Doctortown, Georgia.....	13,600	13,730	5,876	89	-27	6,030	3,900	31
02320500	Suwannee River at Branford, Florida.....	7,880	6,986	4,303	84	-3	4,010	2,590	31
02358000	Apalachicola River at Chattahoochee, Florida.....	17,200	22,420	12,640	94	-6	11,600	7,500	31
02467000	Tombigbee River at Demopolis lock and dam, near Coatspa, Alabama.	15,385	23,520	6,166	98	-26	9,700	6,270	31
02489500	Pearl River near Bogalusa, Louisiana.....	6,573	9,880	3,429	106	-15	3,420	2,210	31
03049500	Allegheny River at Natrona, Pennsylvania.....	11,410	119,580	* 119,710	328	374	29,300	18,900	30
03085000	Monongahela River at Braddock, Pennsylvania.....	7,337	112,480	* 19,760	242	128	31,900	20,600	30
03193000	Kanawha River at Kanawha Falls, West Virginia.....	8,367	12,550	* 6,679	131	-70	7,480	4,830	30
03234500	Scioto River at Higby, Ohio.....	5,131	4,583	* 11,450	680	261	10,400	6,720	31
03294500	Ohio River at Louisville, Kentucky ² #.....	91,170	115,800	* 129,000	263	26	260,000	168,000	30
03377500	Wabash River at Mount Carmel, Illinois.....	28,635	27,660	* 32,770	212	141	56,700	36,600	31
03469000	French Broad River below Douglas Dam, Tennessee ³ #.	4,543	16,739	13,850	93	-64	...	...	...
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wisconsin. ²	6,010	4,238	2,330	97	-29	1,860	1,200	31
04264331	St. Lawrence River at Cornwall, Ontario, near Massena, New York. ⁴ #	298,800	243,900	260,000	95	-4	267,000	173,000	31
02NG001	St. Maurice River at Grand Mere, Quebec.....	16,300	24,910	16,700	84	-13	14,100	9,120	31
05082500	Red River of the North at Grand Forks, North Dakota...	30,100	2,593	2,691	101	30	1,280	827	31
05133500	Rainy River at Manitou Rapids, Minnesota.....	19,400	12,920	14,500	88	-15	11,800	7,630	28
05330000	Minnesota River near Jordan, Minnesota.....	16,200	3,680	* 14,430	344	85	9,300	6,010	31
05331000	Mississippi River at St. Paul, Minnesota ⁵	36,800	111,020	* 23,690	181	75	15,100	9,760	31
05365500	Chippewa River at Chippewa Falls, Wisconsin.....	5,650	5,149	4,930	156	118	3,100	2,000	31
05407000	Wisconsin River at Muscoda, Wisconsin.....	10,400	8,710	5,337	94	15	4,400	2,840	31
05446500	Rock River near Joslin, Illinois.....	9,549	6,080	4,464	128	28	5,500	3,550	31
05474500	Mississippi River at Keokuk, Iowa ⁶	119,000	63,790	* 89,330	143	80	94,600	61,100	31
06214500	Yellowstone River at Billings, Montana.....	11,795	7,056	12,900	86	-35	5,890	3,800	31
06934500	Missouri River at Hermann, Missouri ⁶	524,200	80,880	* 109,300	144	85	180,000	116,000	31
07289000	Mississippi River at Vicksburg, Mississippi ⁵ #.....	1,140,500	584,000	484,400	115	0	613,000	396,000	27
07331000	Washita River near Dickson, Oklahoma.....	7,202	1,402	* 2,817	677	-53	2,410	1,560	28
08276500	Rio Grande below Taos Junction Bridge, near Taos, New Mexico.	9,730	742	379	116	-62	440	284	31
09315000	Green River at Green River, Utah.....	44,850	6,391	† 2,430	42	-43	...	...	...
11425500	Sacramento River at Verona, California.....	21,251	19,430	† 6,085	63	3	...	...	...
13269000	Snake River at Weiser, Idaho.....	69,200	18,520	† 5,930	54	4	5,070	3,280	31
13317000	Salmon River at White Bird, Idaho.....	13,550	11,390	† 5,650	39	-37	3,580	2,310	31
13342500	Clearwater River at Spalding, Idaho.....	9,570	15,510	† 5,400	49	-43	3,550	2,290	31
14105700	Columbia River at The Dalles, Oregon ⁶ #.....	237,000	1193,500	† 1148,700	53	-43	113,000	73,100	31
14191000	Willamette River at Salem, Oregon.....	7,280	123,690	† 13,081	56	-24	5,640	3,640	31
15515500	Tanana River at Nenana, Alaska.....	25,600	23,810	* 69,260	119	2	69,600	45,000	31
08MF005	Fraser River at Hope, British Columbia.....	83,800	96,250	137,700	72	-32	117,000	75,300	30

* Indicates stations excluded from the combination bar/line graph. See Explanation of Data.

† Adjusted.

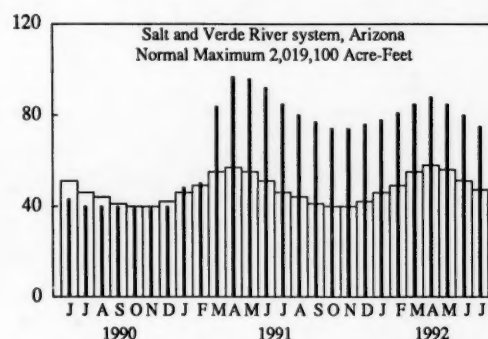
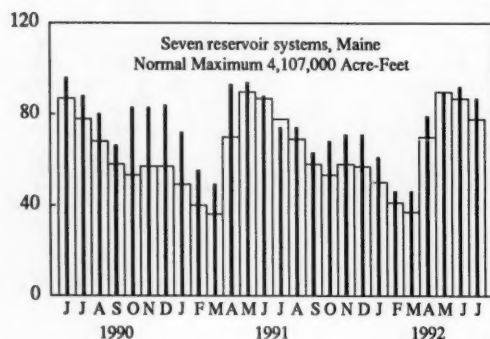
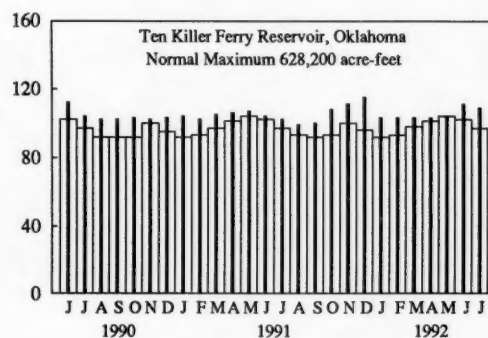
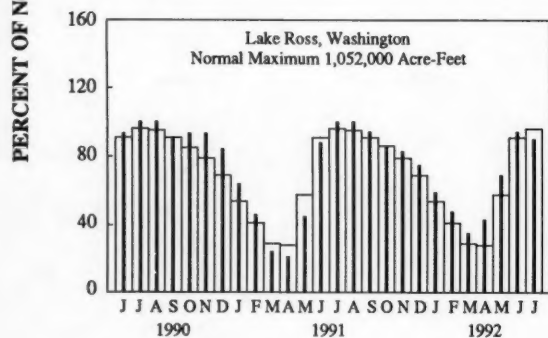
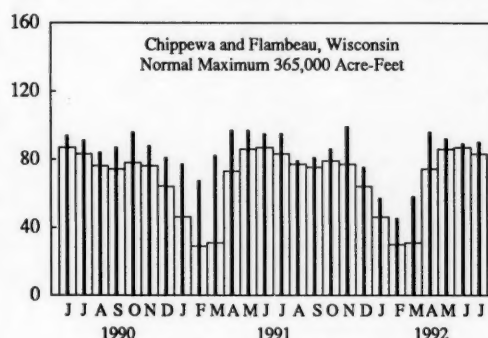
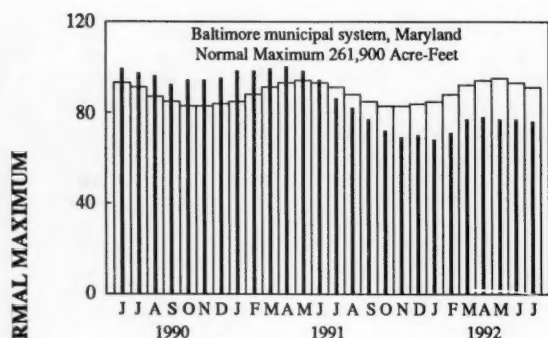
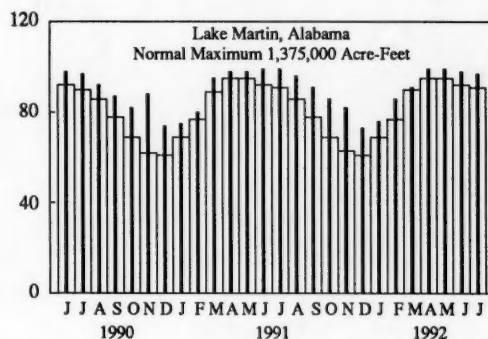
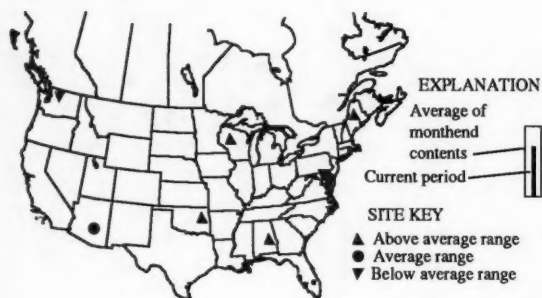
²Records furnished by Corps of Engineers.³Records furnished by Tennessee Valley Authority.⁴Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y., when adjusted for storage in Lake St. Lawrence.⁵Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.⁶Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

* Above-normal range

† Below-normal range

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF JUNE 1992

[Contents are example in percent of reservoir (system) capacity. The usable storage capacity of each reservoir (system) is shown in the column headed "Normal maximum"]



USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS NEAR END OF JULY 1992

[Contents are expressed in percent of reservoir or reservoir system capacity. The usable capacity of reservoir or reservoir system is shown in the column headed "Normal maximum"]

Reservoir or reservoir system						Reservoir or reservoir system					
Principal uses: F-Flood control I-Irrigation M-Municipal P-Power R-Recreation W-Industrial						Principal uses: F-Flood control I-Irrigation M-Municipal P-Power R-Recreation W-Industrial					
Percent of normal maximum						Percent of normal maximum					
End of July 1992	End of July 1991	Average for end of July	End of June 1992	Normal maximum (acre-feet) ¹		End of July 1992	End of July 1991	Average for end of July	End of June 1992	Normal maximum (acre-feet) ¹	
NOVA SCOTIA						NEBRASKA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P).....	† 41	46	60	51	2,226,300	Lake McConaughy (IP).....	† 54	52	74	58	1,948,000
QUEBEC						OKLAHOMA					
Allard (P).....	77	71	76	76	280,600	Enfauks (FPR).....	* 109	92	90	107	2,378,000
Gouxin (P).....	71	72	69	67	6,954,000	Keystone (FPR).....	* 106	82	93	129	661,000
MAINE						Tenkiller Ferry (FPR).....	* 109	102	97	111	628,200
Seven Reservoir Systems (MP).....	* 87	74	78	92	4,107,000	Lake Altus (FIMR).....	* 94	68	66	102	133,000
NEW HAMPSHIRE						Lake O'The Cherokees (FPR).....	* 106	91	92	100	1,492,000
First Connecticut Lake (P).....	87	74	88	87	76,450	OKLAHOMA-TEXAS					
Lake Francis (FPR).....	84	79	86	91	99,310	Lake Texoma (FIMPRW).....	103	97	100	107	2,722,000
Lake Winnepesaukee (PR).....	91	71	88	94	165,700	TEXAS					
VERMONT						Bridgeport (IMW).....	* 96	90	56	98	386,400
Harrison (P).....	79	70	78	85	116,200	Canyon (FMR).....	* 100	88	83	103	385,600
Somerset (P).....	85	71	82	87	57,390	International Amistad (FIMPRW).....	* 98	86	76	98	3,497,000
MASSACHUSETTS						International Falcon (FIMPRW).....	* 103	56	65	105	2,668,000
Cobble Mountain and Borden Brook (MP).....	* 95	81	83	97	77,920	Livingston (IMW).....	* 99	98	91	100	1,788,000
NEW YORK						Possum Kingdom (BMPRW).....	96	91	96	96	370,200
Great Sacandaga Lake (FPR).....	* 90	77	83	95	786,700	Red Bluff (P).....	* 49	18	25	50	307,000
Indian Lake (FMR).....	96	90	91	96	103,300	Toledo Bend (P).....	95	96	90	98	4,472,000
New York City Reservoir System (MW).....	85	74	90	92	1,680,000	Twin Buttes (FIM).....	* 81	37	32	83	177,800
NEW JERSEY						Lake Kemp (IMW).....	93	95	89	99	268,000
Wanaque (M).....	82	62	82	95	85,100	Lake Meredith (FMW).....	* 44	37	38	43	796,900
PENNSYLVANIA						Lake Travis (FIMPRW).....	* 99	92	79	102	1,144,000
Allegheny (FPR).....	50	40	45	47	1,180,000	MONTANA					
Pymatung (FMR).....	* 100	86	93	97	188,000	Canyon Ferry (FIMPR).....	† 78	90	91	75	2,043,000
Raystown Lake (PR).....	68	67	64	68	761,900	Fort Peck (FPR).....	† 58	66	88	59	18,910,000
Lake Wallenpaupack (PR).....	71	73	73	83	157,800	Hungry Horse (FIPR).....	† 74	100	96	76	3,451,000
MARYLAND						WASHINGTON					
Baltimore Municipal System (M).....	† 76	86	91	77	61,900	Ross (PR).....	† 90	100	96	94	1,052,000
NORTH CAROLINA						Franklin D. Roosevelt Lake (IP).....	98	101	99	94	5,022,000
Bridgewater (Lake James) (P).....	* 96	96	90	98	288,800	Lake Chelan (PR).....	98	98	98	97	676,100
Narrows (Bald Lake) (P).....	93	93	96	93	128,900	Lake Cushman (PR).....	101	103	99	101	359,500
High Rock Lake (P).....	* 89	89	78	87	234,800	Lake Merwin (P).....	104	106	105	101	245,600
SOUTH CAROLINA						IDAHO					
Lake Murray (P).....	* 90	89	79	93	1,614,000	Boise River (4 Reservoirs) (FIP).....	† 15	37	73	25	1,235,000
Lakes Marion and Moultrie (P).....	* 79	91	72	90	1,777,000	Coeur d'Alene Lake (P).....	* 99	97	83	98	238,500
SOUTH CAROLINA-GEORGIA						Pend Oreille Lake (FP).....	100	100	96	98	1,561,000
Strom Thurmond Lake (FP).....	71	86	69	74	1,730,000	IDAHO-WYOMING					
GEORGIA						Upper Snake River (8 Reservoirs) (MP).....	† 34	89	70	51	4,401,000
Barton (PR).....	97	99	92	98	104,000	WYOMING					
Sisclair (FMR).....	90	88	90	90	214,000	Boysen (FIP).....	† 78	97	89	72	802,000
Lake Sidney Lanier (FMR).....	60	66	60	64	1,686,000	Buffalo Bill (IP).....	98	98	99	95	421,300
ALABAMA						Keyhole (F).....	† 13	21	46	13	193,800
Lake Martin (P).....	* 97	99	91	98	1,375,000	Pathfinder, Seminole, Alcoma, Kortes, Glendo, and Guernsey Reservoirs (I).....	† 37	47	60	45	3,056,000
TENNESSEE VALLEY						COLORADO					
Clinch Project: Norris and Melton Hill Lakes (FPR).....	* 66	68	57	71	2,293,000	John Martin (FIR).....	† 5	3	22	9	364,400
Douglas Lake (FPR).....	* 77	81	62	82	1,395,000	Taylor Park (IR).....	† 83	94	92	81	106,200
Hiwassee Project: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parkville Lakes (FPR).....	* 86	88	76	90	1,012,000	Colorado-Big Thompson Project (I).....	69	64	72	69	730,300
Holston Project: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR).....	* 76	77	63	87	2,880,000	COLORADO RIVER STORAGE PROJECT					
Little Tennessee Project: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR).....	* 88	90	76	94	1,478,000	Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR).....	† 65	68	82	66	31,620,000
WISCONSIN						UTAH-IDAHO					
Chippewa and Flambeau (PR).....	* 90	95	83	89	365,000	Bear Lake (IPR).....	† 23	36	68	27	1,421,000
Wisconsin River (21 Reservoirs) (PR).....	72	90	74	75	399,000	CALIFORNIA					
MINNESOTA						Folsom (FIMPR).....	† 34	64	74	51	1,000,000
Mississippi River Headwater System (FMR).....	41	44	38	38	1,640,000	Hetch Hetchy (MP).....	† 69	89	80	70	360,400
NORTH DAKOTA						Isabella (FIR).....	† 22	27	43	26	568,100
Lake Sakakawea (Garrison) (FIPR).....	† 64	69	89	63	22,700,000	Pine Flat (FIR).....	† 7	16	52	20	1,001,000
SOUTH DAKOTA						Clair Engle Lake (Lewiston) (FP).....	† 40	44	83	43	2,438,000
Angostura (I).....	† 71	85	81	76	130,770	Lake Almanor (P).....	* 82	80	66	84	1,036,000
Belle Fourche (I).....	† 26	35	54	31	185,200	Lake Berryessa (FIMRW).....	† 32	41	79	35	1,600,000
Lake Francis Case (FIP).....	81	78	84	78	4,589,000	Millerton Lake (FI).....	† 44	61	64	60	503,200
Lake Oahe (FIP).....	† 64	65	74	64	22,240,000	Shasta Lake (FIPR).....	† 52	36	76	56	4,377,000
Lake Sharpe (FIP).....	99	102	101	102	1,697,000	CALIFORNIA-NEVADA					
Lewis and Clark Lake (FIP).....	† 84	80	101	88	432,000	Lake Tahoe (IMPRW).....	† 0	0	68	0	744,600
ARIZONA						NEVADA					
San Carlos (IP).....	* 64	41	22	73	935,100	Rye Patch (I).....	† 0	7	62	0	194,300
Salt and Verde River System (IMPR).....	* 75	85	47	80	2,019,100	ARIZONA-NEVADA					
NEW MEXICO						Lake Mead and Lake Mohave (FIMP).....	75	74	76	75	27,970,000
Conchas (FIR).....	* 92	57	83	96	315,700	ARIZONA					
Elephant Butte and Caballo (FIPR).....	* 88	70	42	93	2,394,000	Salt and Verde River System (IMPR).....	* 75	85	47	80	2,019,100

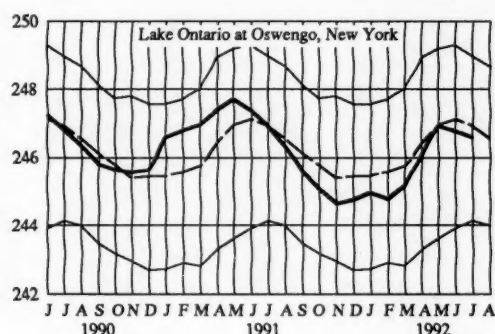
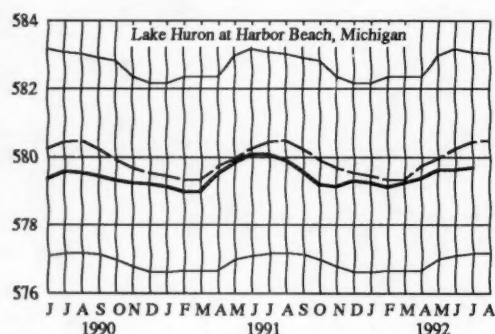
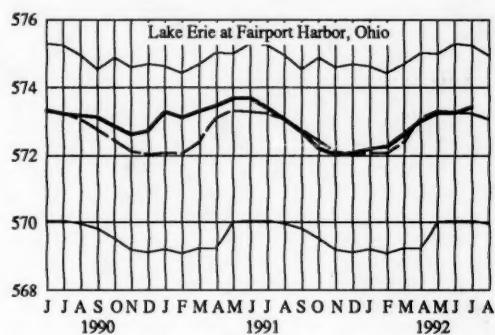
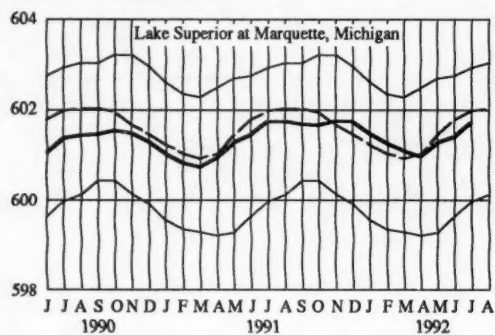
¹ 1 acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second per day.² Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

* Above-average range

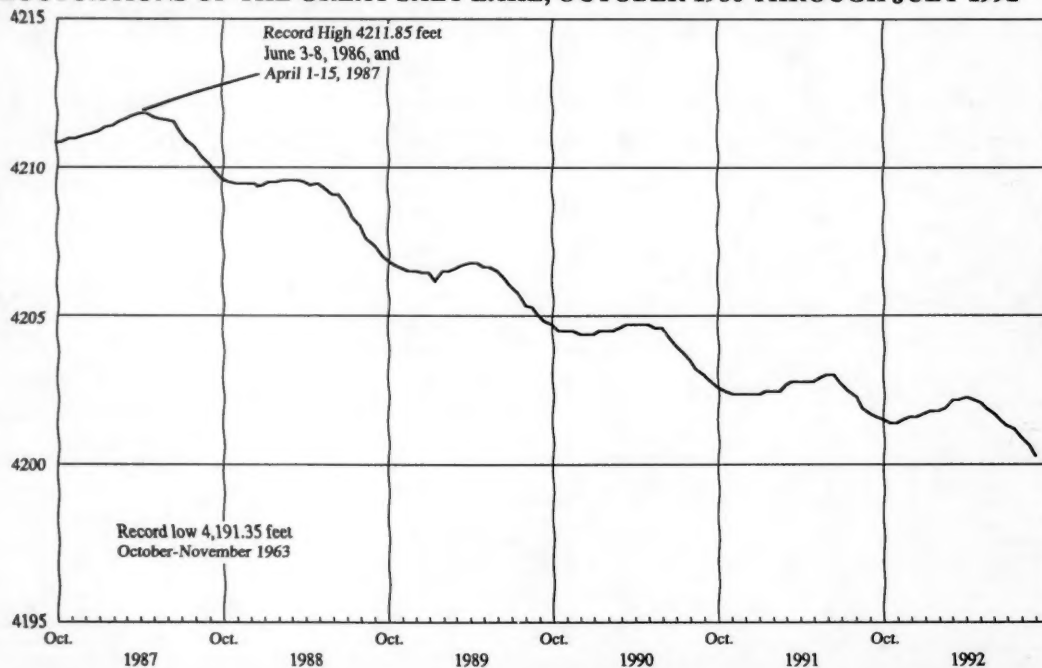
† Below-average range

GREAT LAKES ELEVATIONS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period. Data from national Ocean Service.

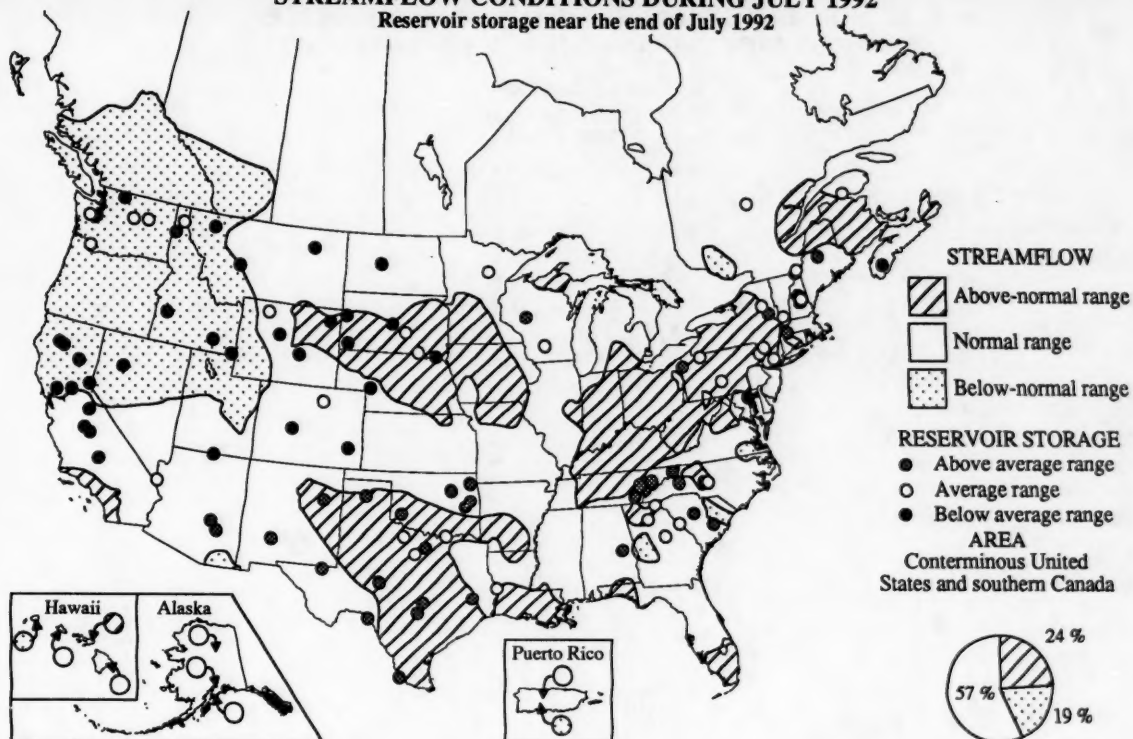


FLUCTUATIONS OF THE GREAT SALT LAKE, OCTOBER 1986 THROUGH JULY 1992



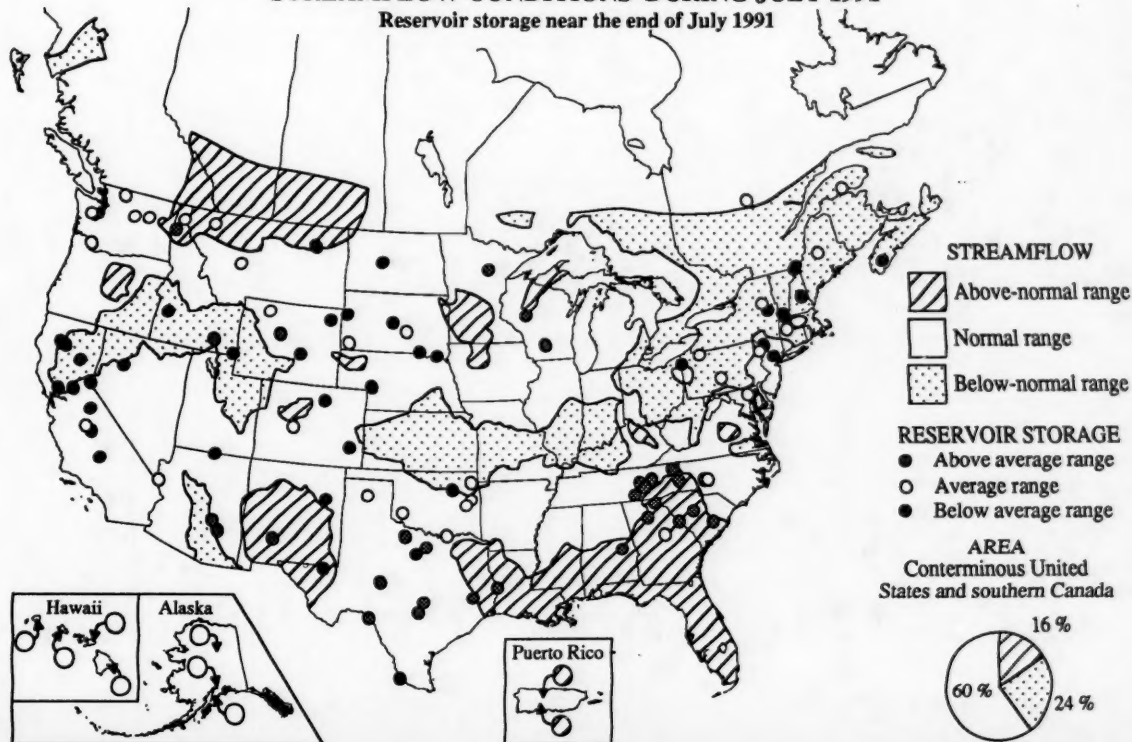
STREAMFLOW CONDITIONS DURING JULY 1992

Reservoir storage near the end of July 1992



STREAMFLOW CONDITIONS DURING JULY 1991

Reservoir storage near the end of July 1991

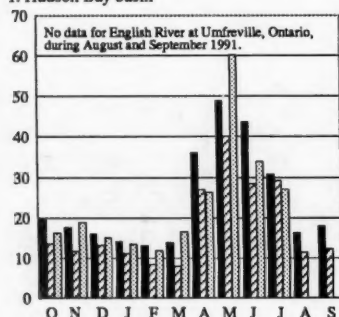


July 1992

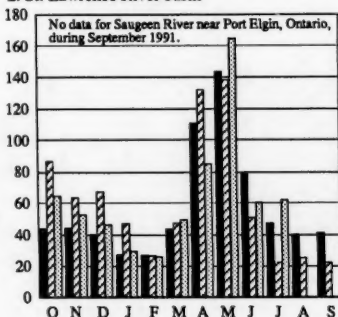
ACTUAL MONTHLY STREAMFLOW, 1991 AND 1992 WATER YEARS, COMPARED WITH MEDIAN MONTHLY STREAMFLOW, 1951-80

MONTHLY MEAN DISCHARGE, THOUSANDS OF CUBIC FEET PER SECOND

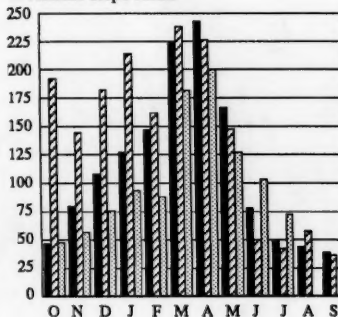
1. Hudson Bay basin



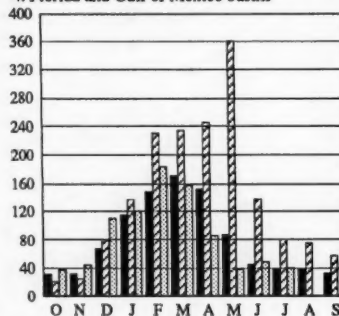
2. St. Lawrence River basin



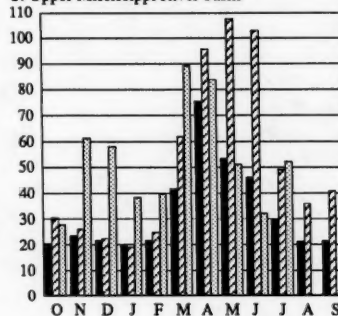
3. Atlantic Slope basins



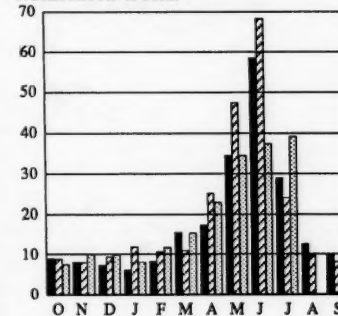
4. Florida and Gulf of Mexico basins



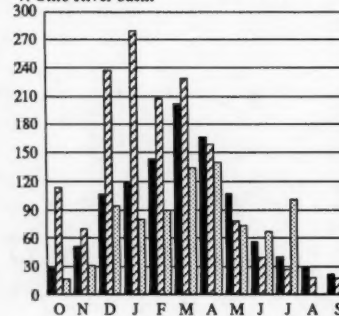
5. Upper Mississippi River basin



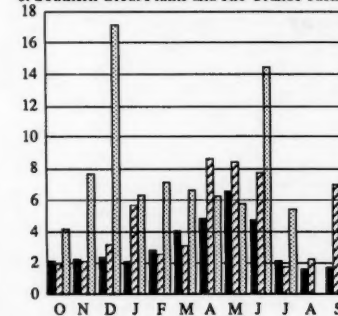
6. Missouri River basin



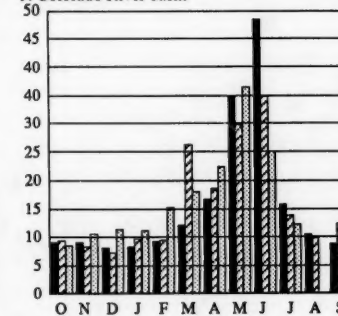
7. Ohio River basin



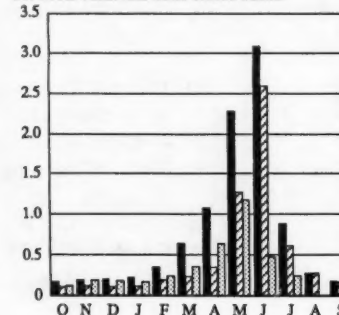
8. Southern Great Plains and Rio Grande basins



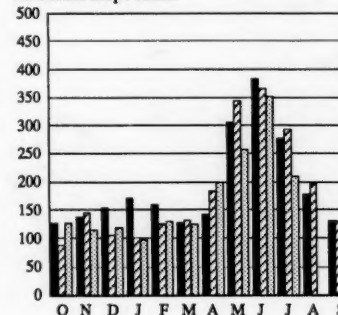
9. Colorado River basin



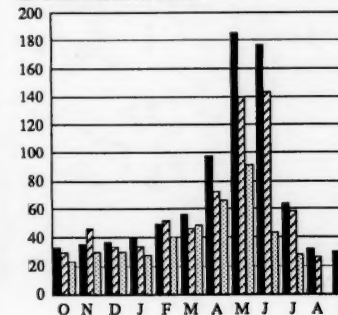
10. Great basin and other closed basins



11. Pacific Slope basins



12. Columbia River basin



■ 1951-80 Median

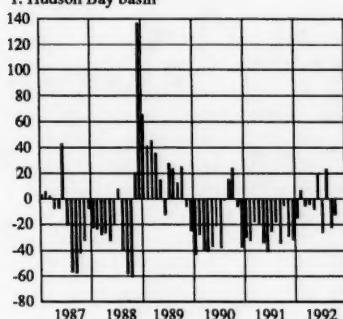
▨ 1991 Water Year

▤ 1992 Water Year

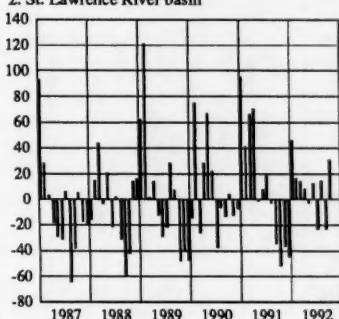
MONTHLY DEPARTURE OF ACTUAL STREAMFLOW (OCTOBER 1986-JULY 1992) FROM MEDIAN STREAMFLOW (1951-80)

PERCENT DEPARTURE FROM 1951-80 MEDIAN STREAMFLOW

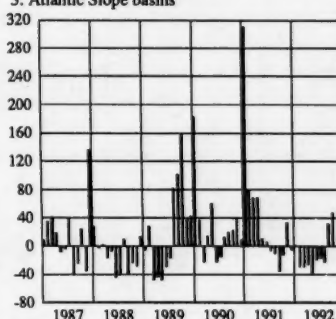
1. Hudson Bay basin



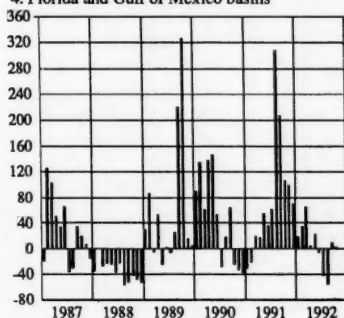
2. St. Lawrence River basin



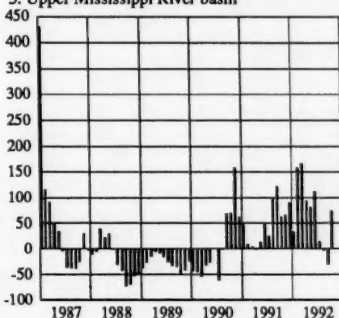
3. Atlantic Slope basins



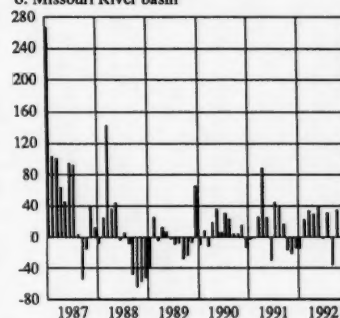
4. Florida and Gulf of Mexico basins



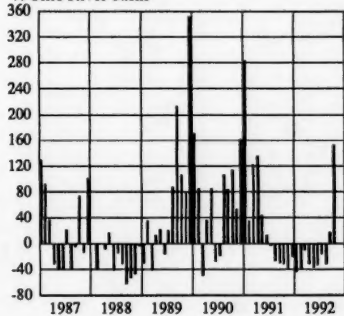
5. Upper Mississippi River basin



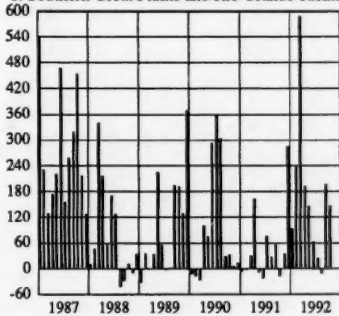
6. Missouri River basin



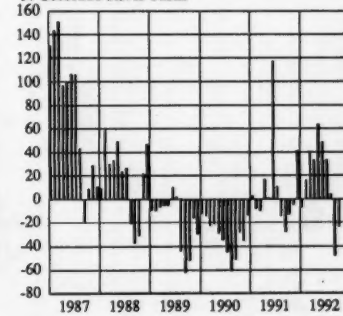
7. Ohio River basin



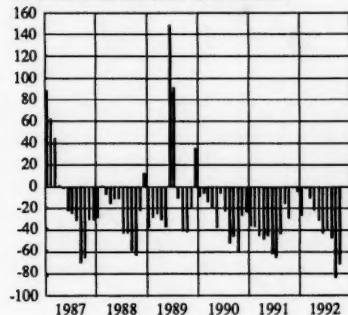
8. Southern Great Plains and Rio Grande basins



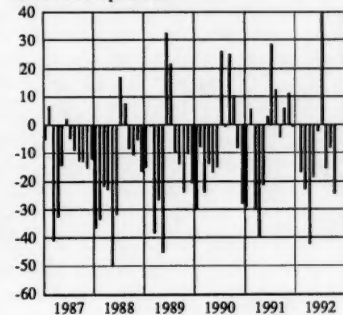
9. Colorado River basin



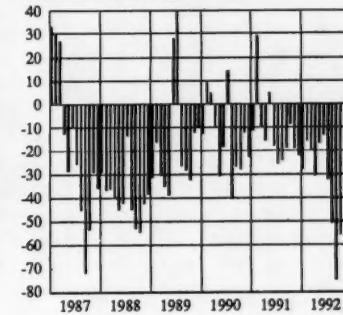
10. Great basin and other closed basins



11. Pacific Slope basins



12. Columbia River basin

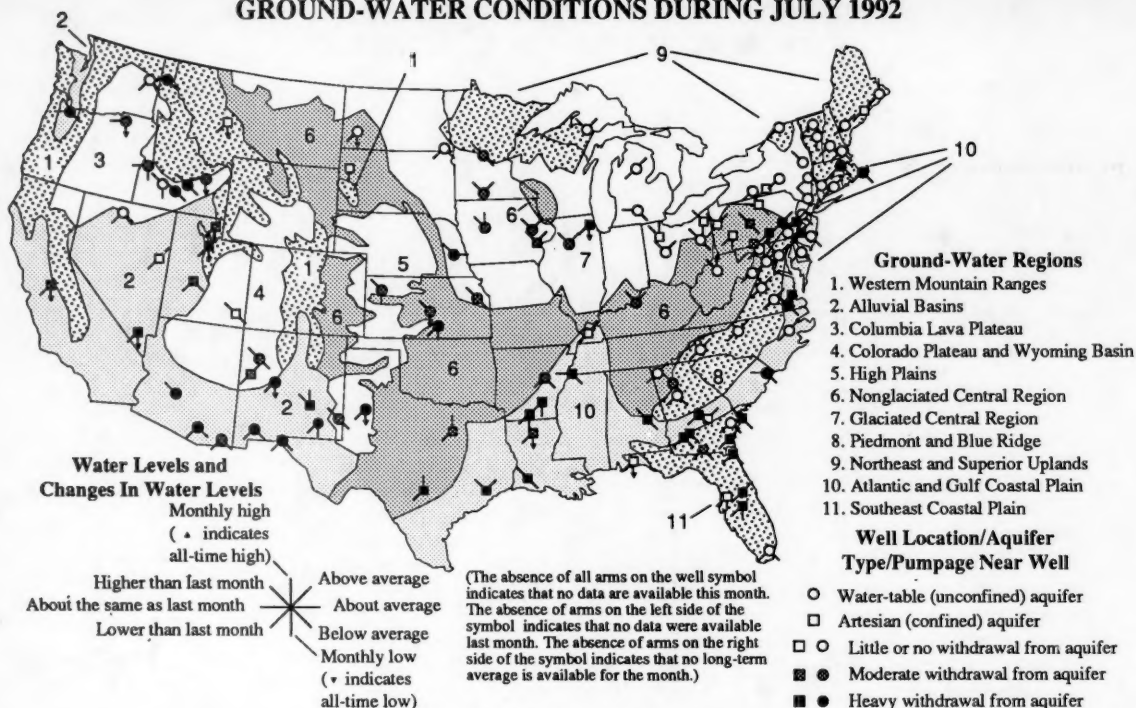


WATER YEAR

WATER YEAR

WATER YEAR

GROUND-WATER CONDITIONS DURING JULY 1992



New extremes occurred at 35 ground-water index stations (see table on page 22) during July — 28 lows (including 15 all-time, counting the equalling of an all-time low set last month) and 7 highs (including 1 all-time)—compared with 25 new extremes last month. Graphs showing water levels at seven stations — for wells in the Columbia Lava Plateau region in Oregon (July low), the Nonglaciaded Central region in Kansas (all-time low), the Glaciaded Central region in Iowa (July high), the Alluvial Basins region in Arizona, the Piedmont and Blue Ridge region in Virginia, and the Atlantic and Gulf Coastal Plain region in Georgia and Massachusetts for the past 26 months are on page 23.

Ground-water levels in the Western Mountain Ranges region were below last month's levels and below long-term average throughout the Region. For the third consecutive month, an all-time low occurred in the Cretaceous aquifer well near Helena, Montana.

In the Alluvial Basins region, levels were at or below last month's levels except in two wells, one in Arizona and one in New Mexico. Levels were below long-term average except in two wells, one in Nevada and one in New Mexico. All-time lows occurred in wells in the: Mehrten aquifer near Wilton, California; Valley-fill aquifer near Las Vegas, Nevada; Basin-fill aquifer near Holladay, Utah; and Basin-fill aquifer near Logan, Utah. July lows occurred in two wells in New Mexico. A July high occurred in the Roswell basin artesian aquifer well in New Mexico. Water level in the Valley fill aquifer well near Douglas, Arizona, is shown in the fourth graph on page 23.

In the Columbia Lava Plateau region, water levels were below last month's in Oregon and generally above last month's in Idaho. Levels were below long-term averages throughout the Region. All-time lows occurred in wells in the Columbia River basalts aquifer at

Pendleton, Oregon (for the fourth consecutive month), and the Snake River Plain aquifer near Atomic City, Idaho (for the fourth consecutive month). July lows occurred in two wells in Idaho (see first graph on page 23 for levels in the Shallow alluvium aquifer near Meridian) and Oregon. Water levels in the Valley-fill aquifer near Douglas, Arizona, is shown in the fourth graph on page 23.

Ground-water levels in the Colorado Plateau and Wyoming Basin region were above last month's levels in Utah and mixed with respect to last month's levels in New Mexico. Levels were below long-term average in Utah and mixed with respect to average in New Mexico.

In the High Plains region, ground-water levels were below last month's levels in Texas and Oklahoma, and above last month's levels in Kansas and New Mexico. Levels were below long-term average throughout the Region. An all-time low occurred in the Ogallala aquifer well near Lubbock, Texas (for the fourth consecutive month and the eighth time this year), and a July low occurred in the well in Kansas.

Ground-water levels in the Nonglaciaded Central region were below last month's levels except in Kentucky and West Virginia, and also in one well in Pennsylvania. Water levels were above long-term averages in Texas, Kentucky, Maryland, West Virginia, and Georgia; and below average elsewhere. An all-time low occurred in the wells in the Sentinel Butte aquifer near Dickinson, North Dakota (for the third consecutive month and the eighth time this year), and the Equus aquifer near Halstead, Kansas (see second graph on page 23). An all-time high occurred in the Upper Pennsylvanian aquifer well near Glenville, West Virginia. July lows occurred in wells in South Dakota, Kansas, and Pennsylvania. July highs occurred in two wells in Texas.

WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES—JULY 1992

GROUND-WATER REGION Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well in feet	Water level in feet below land- surface datum	Departure from average in feet	Net change in water level in feet since:		Year records began	Remarks
					Last month	Last year		
WESTERN MOUNTAIN RANGES (1)								
Rathdrum Prairie aquifer near Athol, northern Idaho	●	485	463.4	-3.7	-0.1	-5.8	1929	
ALLUVIAL BASINS (2)								
Alluvial valley fill aquifer in Steptoe Valley, Nevada	□	122	9.28	3.20	-.39	-.36	1949	
Valley fill aquifer, Elfrida area near Douglas, Arizona	●	124	101.22	-16.31	-.07	.85	1947	
Hueco bolson aquifer at El Paso, Texas	●	640	-272.78	-17.69	-1.07	.05	1964	
COLUMBIA LAVA PLATEAU (3)								
Snake River Plain aquifer near Eden, Idaho	●	208	123.3	-5.1	1.9	1.6	1962	
Columbia River basalts aquifer, Pendleton, Oregon	●	1,501	228.26	-37.66	-.04	-5.81	1965	All-time low
COLORADO PLATEAU AND WYOMING BASIN (4)								
Dakota aquifer near Blanding, Utah	□	140	48.28	-2.67	1.88	.46	1960	
HIGH PLAINS (5)								
Ogallala aquifer near Colby, Kansas	●	175	131.23	-11.83	.20	-.48	1947	July low
Southern High Plains aquifer, Lovington, New Mexico	●	212	58.67	-3.76	.16	1.67	1971	
NONGLACIATED CENTRAL REGION (6)								
Sentinel Butte aquifer near Dickinson, North Dakota	○	160	22.11	-4.46	-.08	-.92	1968	All-time low
Sand and gravel Pleistocene aquifer near Valley Center, Kansas	●	54	20.63	-3.72	-.87	-.06	1937	July low
Glacial outwash sand and gravel aquifer near Louisville, Kentucky	●	94	18.20	5.81	.20	-1.41	1945	
Upper Pennsylvanian aquifer in the Central Appalachians Plateau near Glenville, West Virginia	○	25	11.36	5.47	.19	2.61	1953	All-time high
GLACIATED CENTRAL REGION (7)								
Fluvial sand and gravel aquifer, Platte River Valley, near Ashland, Nebraska	●	12	5.45	-.02	.67	-.02	1933	
Sheyenne Delta aquifer near Wyndmere, North Dakota	○	40	6.30	-1.20	-2.32	1.20	1963	
Pleistocene (glacial drift) aquifer at Princeton in northern Illinois	●	29	6.30	4.69	.60	2.10	1942	
Shallow drift aquifer near Roscommon in north-central part of Lower Peninsula, Michigan	○	14	4.25	.40	-.40	.06	1934	
Silurian-Devonian carbonate aquifer near Dola, Ohio	□	51	5.96	1.32	.42	2.04	1954	July high
PIEDMONT AND BLUE RIDGE (8)								
Water-table aquifer in Petersburg Granite, southeastern Piedmont, Colonial Heights, Virginia	○	100	15.85	-.23	-.45	.91	1939	
Weathered granite aquifer, western Piedmont, Mocksville area, North Carolina	○	31	16.46	1.76	-.98	-.92	1981	
Surficial aquifer at Griffin, Georgia	○	30	17.35	-1.81	-.90	-2.80	1943	
NORTHEAST AND SUPERIOR UPLANDS (9)								
Pleistocene glacial outwash aquifer, at Camp Ripley, near Little Falls, Minnesota	●	59	14.92	-1.1	.39	-1.26	1949	
Glacial outwash sand aquifer at Oxford, Maine	○	39	8.40	.14	-.16	.35	1980	
Shallow sand aquifer (glacial deposits), Acton, Massachusetts	●	34	19.51	-.60	-.64	.19	1965	
Pleistocene sand aquifer near Morrisville, Vermont	○	50	20.12	-.66	-.40	.04	1966	
ATLANTIC AND GULF COASTAL PLAIN (10)								
Columbia deposits aquifer near Camden, Delaware	○	11	8.17	-1.73	-.52	-.30	1950	
Memphis sand aquifer near Memphis, Tennessee	■	384	107.60	-16.07	-.02	-.62	1940	
Eutaw aquifer in the City of Montgomery, Alabama	■	270	24.3	-1.0	2.1	.6	1952	
Evangeline aquifer at Houston, Texas	■	1,152	282.05	19.33	.47	19.04	1978	
SOUTHEAST COASTAL PLAIN (11)								
Upper Floridan aquifer on Cockspur Island, Savannah area, Georgia	■	348	33.90	-4.67	.32	1.46	1956	
Upper Floridan aquifer, Jacksonville, Florida	■	905	-21.3	-5.2	-.1	-1.7	1930	
Biscayne aquifer near Homestead, Florida	○	20	6.77	-.24	-1.00	-.22	1932	

Ground-water levels in the Glaciated Central region were generally below last month's in North Dakota and New York, mixed in Illinois, and generally above last month's levels elsewhere. Levels were generally below long-term averages in North Dakota, Kansas, Illinois, and Ohio, mixed in both Minnesota and Pennsylvania, and generally above average elsewhere in the Region. An all-time low occurred in the well in the Lower Mt. Simon aquifer well at Illinois Beach State Park, Illinois (for the fourth consecutive month). A July low occurred in a well in Ohio. July highs occurred in wells in Iowa

(see third graph on page 23) and Ohio.

In the Piedmont and Blue Ridge region, ground-water levels were below last month's in Virginia, North Carolina, and New Jersey, mixed in Pennsylvania and Georgia, and above last month's in Maryland. Levels were below long-term averages in Georgia and New Jersey, mixed in Pennsylvania, and generally above long-term averages in Maryland, Virginia, and North Carolina. Water levels in the Water-table aquifer at Thelma, Virginia, are shown in the fifth graph on page 23.

NEW EXTREMES DURING JULY AT GROUND-WATER INDEX STATIONS

WRD Station Identification Number	GROUND-WATER REGION Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well	Years of record	End-of-month water level in feet below land surface datum		
					Previous July Record		
					Average	Extreme (year)	July 1992
LOW WATER LEVELS							
WESTERN MOUNTAIN RANGES (1)							
463906112043901	Cretaceous aquifer near Helena, Montana	□	110	16	31.40	37.85 (1988)	¹ 38.92
ALLUVIAL BASINS (2)							
382444121123301	Mehrten aquifer near Wilton, California	■	300	6	137.15	139.33 (1991)	¹ 142.89
361611115151301	Valley-fill aquifer near Las Vegas, Nevada	■	905	47	37.70	105.79 (1991)	¹ 110.72
324340104231701	Roswell Basin shallow aquifer at Dayton, New Mexico	●	250	41	92.90	123.02 (1991)	¹ 123.13
351051106395301	Basin-fill aquifer at Albuquerque, New Mexico	●	980	10	34.82	38.20 (1991)	39.16
403803111505301	Basin-fill aquifer near Holladay, Utah	■	165	14	75.30	92.91 (1991)	¹ 95.99
414501111520001	Basin-fill aquifer near Logan, Utah	■	43	52	-18.1	-22.6 (1984)	¹ -10.3
COLUMBIA LAVA PLATEAU (3)							
453934118491701	Columbia River basalts aquifer at Pendleton, Oregon	●	1,501	26	190.60	222.45 (1991)	¹ 228.26
432700112470801	Snake River Plain aquifer near Atomic City, Idaho	●	636	44	585.2	589.1 (1982)	¹ 589.1
425635114382302	Snake River Plain aquifer at Gooding, Idaho	○	165	21	134.1	146.1 (1991)	149.2
433852116244801	Shallow alluvium aquifer near Meridian, Idaho	●	32	51	4.8	7.0 (1990)	8.8
HIGH PLAINS (5)							
341010102240801	Ogallala aquifer near Lubbock, Texas	●	202	42	55.64	92.11 (1991)	¹ 94.20
392329101040201	Ogallala aquifer near Colby, Kansas	●	175	46	119.40	130.75 (1991)	¹ 131.23
NONGLACIATED CENTRAL REGION (6)							
465755102410701	Sentinel Butte aquifer near Dickinson, North Dakota	○	160	24	17.65	21.19 (1991)	¹ 22.11
441759103261201	Minnelusa aquifer near Tiford, South Dakota	□	302	7	27.18	49.31 (1990)	53.68
375039097234201	Sand and gravel pleistocene aquifer near Valley Center, Kansas	●	54	55	16.91	20.57 (1991)	20.63
375810097324301	Equus aquifer near Halstead, Kansas	●	57	53	24.00	40.71 (1991)	¹ 40.74
402138079031802	Shale aquifer at State Game Land 42, Pennsylvania	○	110	15	18.06	20.38 (1969)	20.72
402615075530501	Carbonate aquifer at Blandon, Pennsylvania	■	385	17	128.75	137.64 (1981)	¹ 137.66
GLACIATED CENTRAL REGION (7)							
422803087475302	Lower Mt. Simon aquifer at Illinois Beach State Park, Illinois	■	2,264	4	202.27	204.57 (1990)	¹ 206.36
411401081025000	Pennsylvanian sandstone aquifer near Windham, Ohio	□	55	47	19.36	21.93 (1988)	22.10
ATLANTIC AND GULF COASTAL PLAIN (10)							
331438092411901	Sparta aquifer near El Dorado, Arkansas	■	540	38	333.16	356.20 (1966)	360.05
341138091551601	Sparta aquifer near Pine Bluff, Arkansas	■	1,106	34	209.95	238.90 (1990)	241.30
321357092341701	Sparta aquifer near Ruston, Louisiana	■	763	49	223.83	236.80 (1991)	¹ 237.90
303108087162301	Sand and gravel aquifer at Ensley, Florida	□	239	53	74.07	81.78 (1974)	¹ 83.89
372506076511703	Upper Potomac aquifer near Toana, Virginia	■	401	7	158.93	161.48 (1990)	¹ 164.10
SOUTHEAST COASTAL PLAIN (11)							
275411081372001	Upper Floridan aquifer near Lake Wales, Florida	■	634	11	25.89	29.00 (1989)	29.34
281715082164401	Upper Floridan aquifer near San Antonio, Florida	□	150	29	40.62	46.87 (1981)	50.47
HIGH WATER LEVELS							
ALLUVIAL BASINS (2)							
332615104303601	Roswell basin artesian aquifer at Roswell, New Mexico	●	324	46	64.01	44.8 (1991)	41.10
NONGLACIATED CENTRAL REGION (6)							
324842097102901	Twin Mountains (Trinity) aquifer near Hurst/Fort Worth, Texas	●	667	45	460.95	443.25 (1991)	439.38
292845098255401	Edwards aquifer at San Antonio, Texas	■	874	41	67.39	40.00 (1935)	38.70
385604080495901	Upper Pennsylvanian aquifer near Glenville, West Virginia	○	25	39	16.83	12.52 (1990)	² 11.36
GLACIATED CENTRAL REGION (7)							
421837094083601	Unconsolidated glacial-drift aquifer near Harcourt, Iowa	●	42	50	4.68	2.63 (1981)	2.33
404648083412600	Silurian-Devonian carbonate aquifer near Dola, Ohio	□	51	38	7.28	6.11 (1958)	5.96
NORTHEAST AND SUPERIOR UPLANDS (9)							
445227067520101	Glacial sand and aquifer at Hadley Lakes, Maine	○	30	7	5.48	...	4.97

¹ All-time month-end low.² All-time month-end high.

In the Northeast and Superior Uplands region, ground-water levels were above last month's levels in Wisconsin and below last month's levels elsewhere in the Region. Water levels were below average in New Hampshire, Vermont, and Massachusetts, and above average elsewhere in the Region. A July high occurred in a well in Maine.

In the Atlantic and Gulf Coastal Plain region, water levels were above last month's in Alabama and Texas, mixed in Georgian and Louisiana, about the same in South Carolina and Tennessee, and generally below last month's levels elsewhere in the Region. Ground-water levels generally were above long-term averages in North Carolina, Kentucky, and Texas, mixed in Georgia, and below average

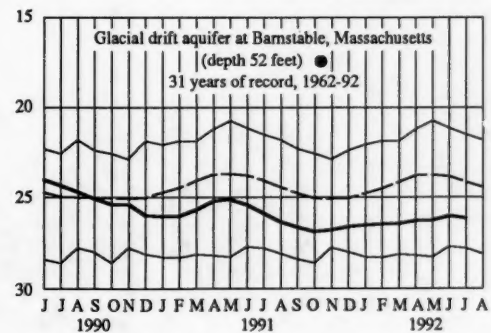
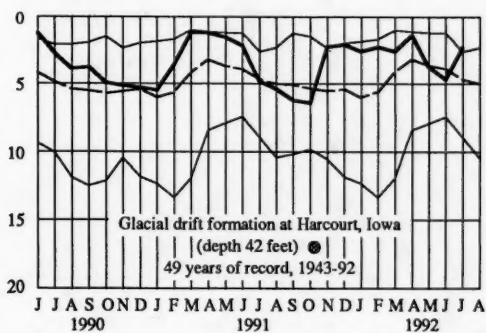
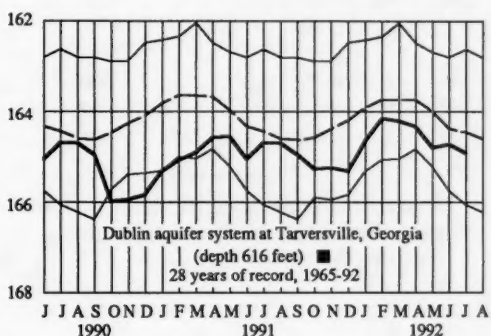
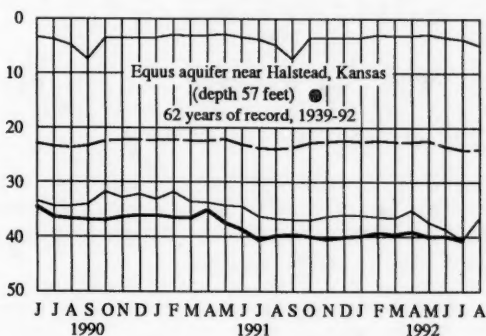
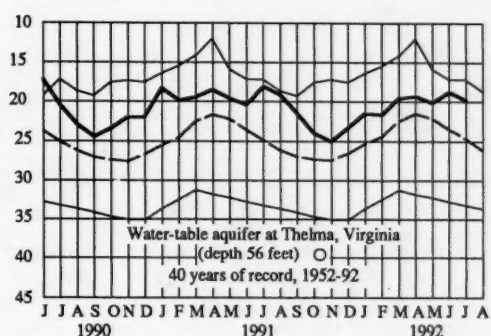
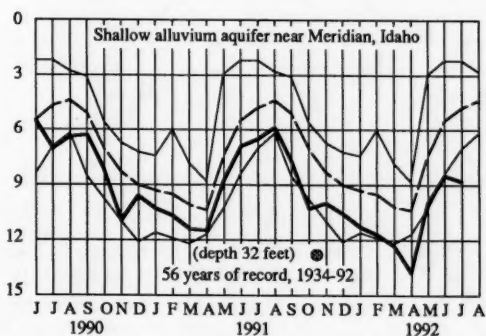
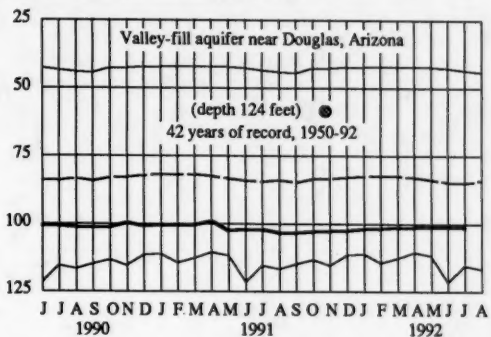
elsewhere. All-time lows occurred in wells in the: Sparta aquifer near Ruston, Louisiana (for the fourth consecutive month); Sand and gravel aquifer at Ensley, Florida; and Upper Potomac aquifer near Toana, Virginia (for the fourth consecutive month and the ninth time this year). July lows occurred in two wells in Arkansas. Water levels in the Dublin aquifer system well at Taversville, Georgia, and the Glacial drift aquifer well at Barnstable, Massachusetts, are shown in the last two graphs on page 23.

In the Southeast Coastal Plain region, water levels were generally below last month's and also below long-term averages throughout the Region. July lows occurred in two wells in Florida.

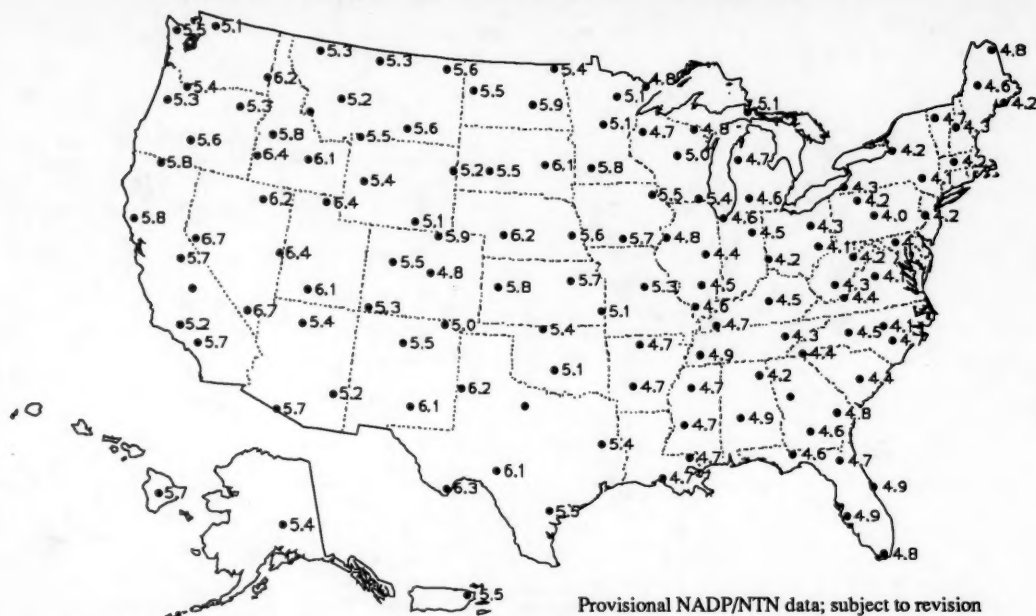
MONTHEND GROUND-WATER LEVELS IN SELECTED WELLS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.

WATER LEVEL, FEET BELOW LAND-SURFACE DATUM



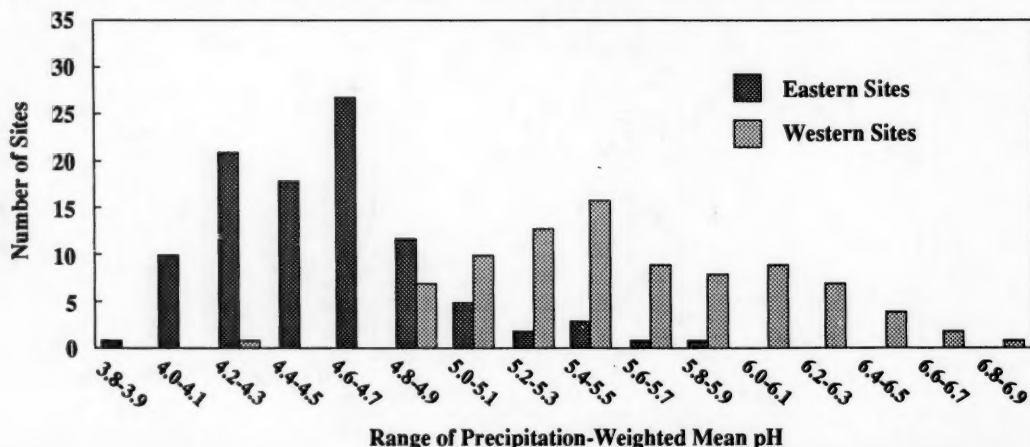
pH of Precipitation for June 22-July 26, 1992



Current pH data shown on the map (• 4.9) are precipitation-weighted means calculated from preliminary laboratory results provided by the NADP/NTN Central Analytical Laboratory at the Illinois State Water Survey and are subject to change. The 128 points (•) shown on this map represent a subset of all sites chosen to provide relatively even geographic spacing. Absence of a pH value at a site indicates either that there was no precipitation or that data for the site did not meet preliminary screening criteria for this provisional report.

A list of the approximately 200 sites comprising the total Network and additional data for the sites are available from the NADP/NTN Coordination Office, Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO 80523.

Distribution of precipitation-weighted mean pH for all NADP/NTN sites having one or more weekly samples for June 22-July 26, 1992. The East/West dividing line is at the western borders of Minnesota, Iowa, Missouri, Arkansas, and Louisiana.



BUREAU OF RECLAMATION RESERVOIR STORAGE IN SELECTED RIVER BASINS JULY 31, 1992

River basin number	Basin	Storage, in 1,000 acre-feet	Percent of average	River basin number	Basin	Storage, in 1,000 acre-feet	Percent of average
1	South Fork Flathead	2,114	74	23	Bighorn	2,276	100
2	Yakima	490	59	24	North Platte	1,326	58
3	Columbia	5,759	99	25	Cheyenne	209	58
4	Upper Snake	1,242	40	26	South Platte ²	700	91
5	Boise	85	10	27	Arkansas ³	467	96
6	Payette	505	73	28	Upper Green ⁴	3,210	186
7	Owyhee	9	2	29	Gunnison ⁵	686	183
8	Malheur	0	0	30	San Juan ⁶	1,586	194
9	Umatilla	23	42	36	Upper Colorado ⁷	14,914	161
10	Deschutes	144	43	37	Klamath	232	35
11	Rogue	29	29	38	Humboldt	0	0
12	Tualatin	36	84	39	Truckee (excluding Lake Tahoe)	91	55
13	Sacramento	2,191	83	40	Carson	4	3
14	Trinity	959	53	41	Santa Ynez	171	130
15	Feather	1,563	69	42	Ventura	197	97
16	American	299	51	43	Republican	403	76
17	San Joaquin	206	75	44	Solomon	283	103
18	Stanislaus	176	14	45	Niobrara	74	116
19	Lower Colorado	21,466	176	46	Lower Platte	177	121
21	Lower Rio Grande	2,429	92	47	Washita	253	127
22	Upper Missouri	2,438	89				

[1 acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second per day. The percent of average storage refers to the average storage on that date over a historic period of record which varies by reservoir.]

¹Percent of storage capacity rather than percent of average.

²Includes Colorado River storage water for the Colorado Big-Thompson Project.

³Includes Fryingpan-Arkansas Project storage water.

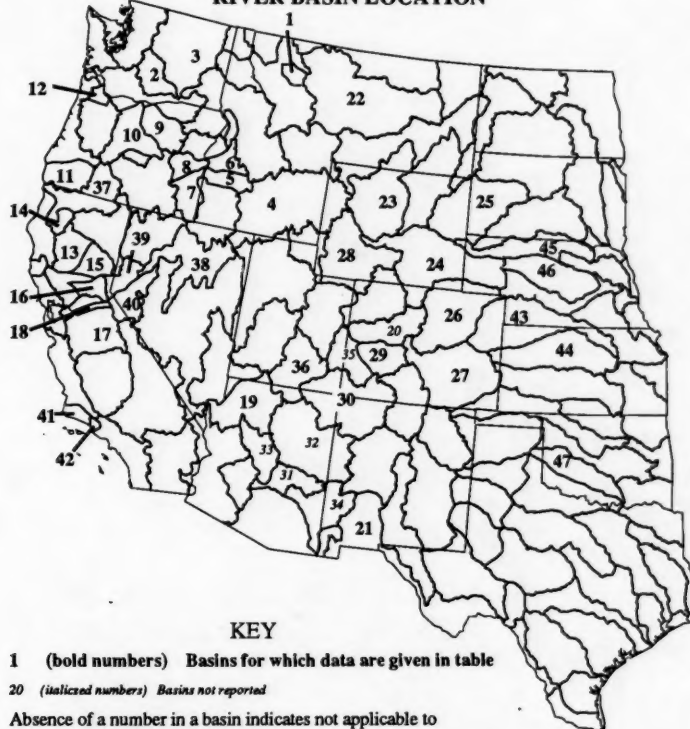
⁴Flaming Gorge Dam storage water.

⁵Blue Mesa Dam storage water.

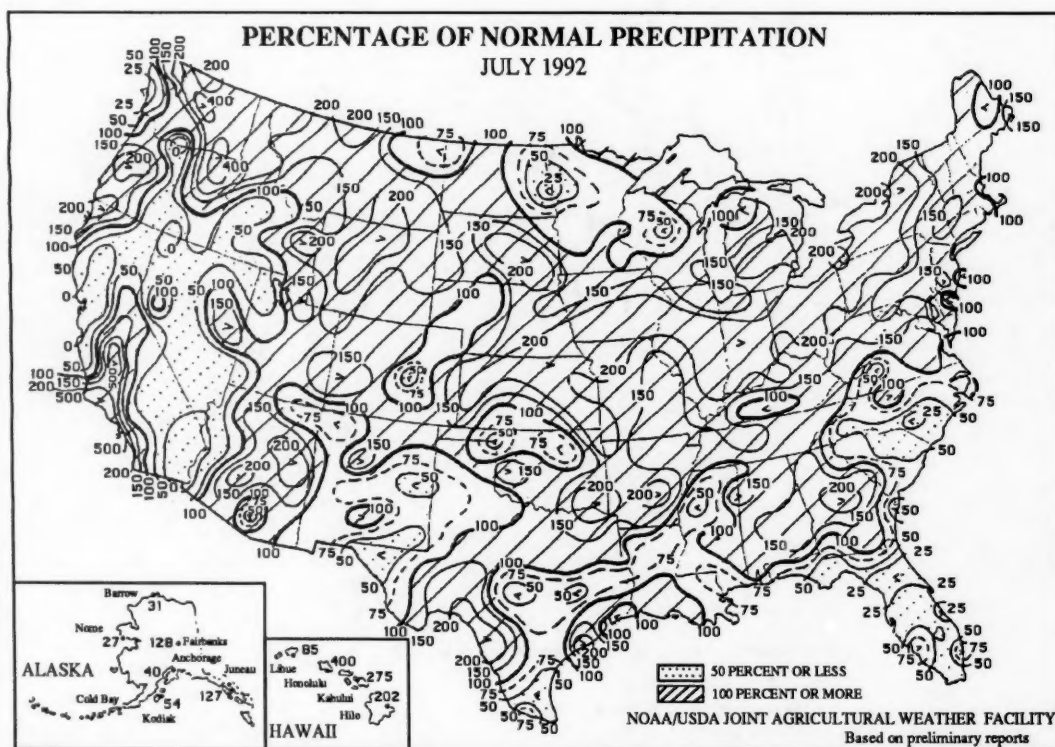
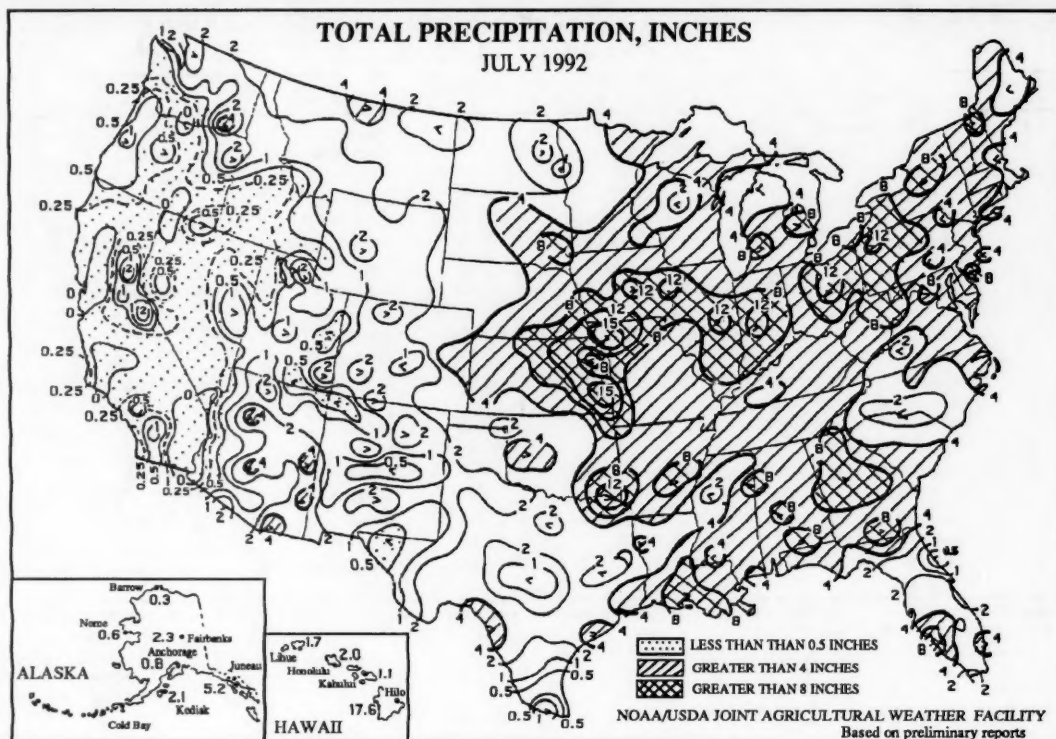
⁶Navajo Reservoir storage water.

⁷Lake Powell storage only.

RIVER BASIN LOCATION



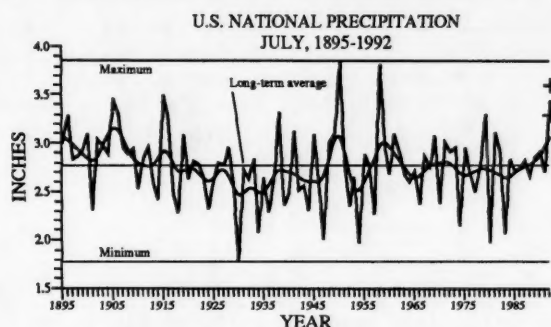
(From *Water Supply Conditions for the Western States*, U.S. Bureau of Reclamation)



(From *Weekly Weather and Crop Bulletin*, NOAA/USDA Joint Agricultural Weather Facility)

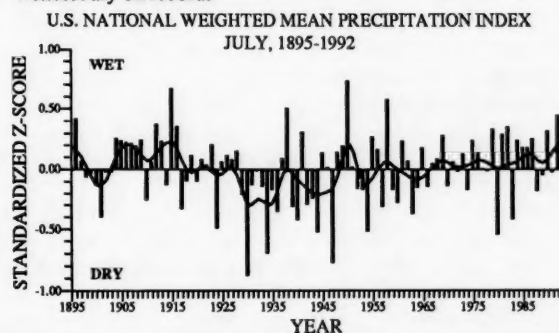
UNITED STATES JULY CLIMATE IN HISTORICAL PERSPECTIVE

Preliminary data for July 1992 indicate that temperature averaged across the contiguous United States was much below the long-term mean. July 1992 ranked as the 3rd coolest July on record (the record begins in 1895). This is a significant departure from the near normal July temperatures which had dominated the previous eleven years. The 1992 value is based on preliminary data, which has been shown to be within 0.26 °F of the final data over a 46-month period. Nearly one half of the country (45.2 percent) averaged much cooler than normal while a twelfth (8.5 percent) averaged much warmer than normal for July 1992.



Areally-averaged precipitation for the nation was above the long-term mean (see graph above), ranking July 1992 as the 5th wettest (93rd driest) July on record. The preliminary value for precipitation is estimated to be accurate to within 0.14 inches and the confidence interval is plotted in the graph as a '+'. One-fifth (22.0 percent) of the country experienced much wetter than normal conditions and a tenth (9.7 percent) was much drier than normal.

Historical precipitation is shown in a different way in the graph below. The July precipitation for each climate division in the contiguous U.S. was first standardized using the gamma distribution over the 1951-80 period. These gamma-standardized values were then weighted by area and averaged to determine a national standardized precipitation value. Negative values are dry, positive are wetter than the mean. This index gives a more accurate indication of how precipitation across the country compares to the local normal climate. The areally-weighted mean standardized national precipitation also ranked 1992 as the 5th wettest July on record.



The temperature and precipitation rankings for July 1992 for the nine climatically homogeneous regions in the United States are listed in Table 1. The overall precipitation pattern consisted of wetter than average conditions in the northern half of the country and the Southern region while drier than normal conditions existed only in the Southeast and Southwest. Considerable extremes in precipitation occurred, with the Central region having the second wettest July on record while the Southeast region had the 17th driest July on record. The entire country, excepting the Southeast, Southwest, and West regions, was dominated by a northwest to southeast upper level flow pattern most of the month which extended further to the south than what is considered normal for July. This led to several occurrences of distinct frontal zones extending nearly east to west from the mid-Atlantic to the central Rockies. To the north of this front temperatures were much cooler than those to the south. For example, the East North Central region reported the coolest July since records began in 1895 and it was the second coolest July for both the Northeast region and the West North Central region. To the south of the front, the Southeast region, which was dominated by the Bermuda high pressure system, reported the fourteenth warmest July since records have been kept.

July 1992 temperature rankings for the 48 contiguous states show that 20 states had the 10th coolest, or cooler, July on record while 8 of these states (IA, ME, MA, MI, MN, NE, NY, WI) reported their coolest July since records have been documented. It was the second coolest July for Montana, North Dakota and South Dakota, third coolest for New Hampshire and fourth for Utah and Vermont. Three states, Florida, and North and South Carolina ranked in the top ten at the other end of the scale, with July 1992 recorded as the second warmest since 1895 for North Carolina.

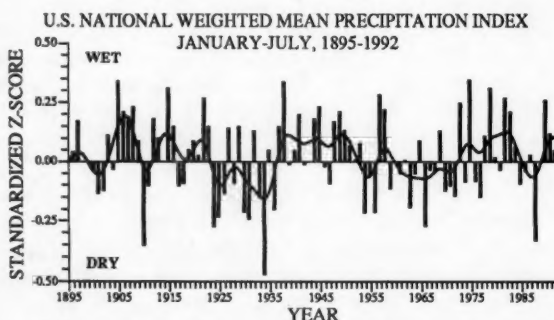
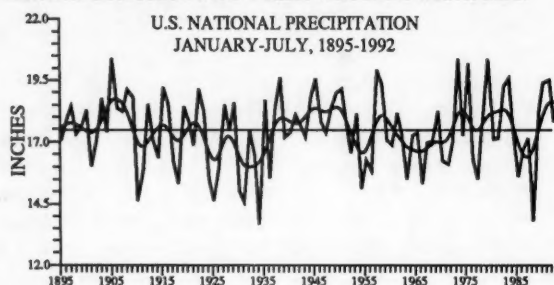
For the year thus far, the nation as a whole continued unusually warm, with January-July 1992 ranking as the seventh warmest such period on record. About a quarter (23.7 percent) of the country had January-July average temperatures much warmer than normal while about 1 percent averaged much cooler than normal.

Year-to-date temperature rankings for the 48 contiguous states show that 12 states ranked in the top 10 warmest category, with Washington having the warmest January-July on record while Idaho, Oregon and Wyoming each report their second warmest January through July period. Montana and Nevada ranked third. Although none of the states ranked in the top ten coolest category for year to date, six states (AL, GA, ME, MA, NY, and VT) had rankings in the cool third of the historical distribution.

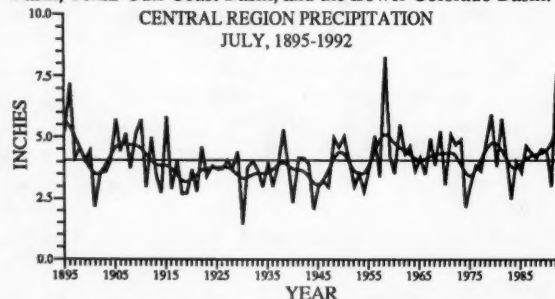
Precipitation averaged across the contiguous U.S., for the year thus far (first graph below), ranks 1992 in the middle of the historical distribution at 43rd wettest (56th driest). When the local normal climate is taken into account (second graph below), the year to date ranks as the 42nd wettest such period on record. About a seventh (13.4 percent) of the nation averaged much wetter than normal while about a tenth (9.1 percent) averaged much drier than

(From *Climate Variations Bulletin*, National Climatic Data Center, NOAA)

normal. January-July precipitation rankings for the 48 contiguous states (Table 4) give an indication of the year-to-date regional pattern. Three states (DE, ID, and WI) had rankings in the top 10 driest category. Four states (AZ, KS, NM, and TX) ranked in the top 10 wettest. A total of 20 states were in the driest third of the historical distribution while 7 states were in the wettest third.

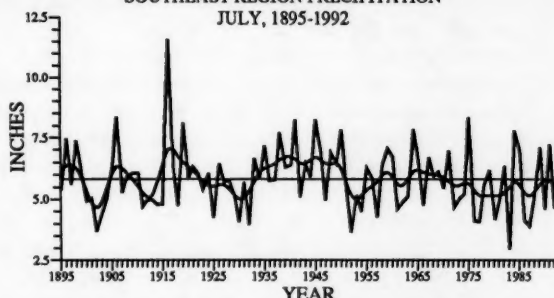


There was some change in national long-term drought conditions in July compared to June. The percent area of the contiguous U.S. experiencing severe to extreme long-term drought (as defined by the Palmer Drought Index) dropped to 13.8 percent while the percent area experiencing long-term wet conditions increased to include over one-fifth of the country (21.0 percent). The core drought areas appear to be focused in the Great Basin and Pacific Northwest, while the core wet areas were located in the Rio Grande Basin, Texas Gulf Coast Basin, and the Lower Colorado Basin.



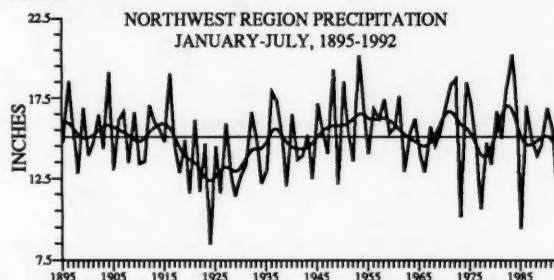
A graph of July precipitation for the Central region is shown above. As was mentioned earlier, July 1992 was the second wettest for this region since records began and continues an above normal pattern, for July, for six of the last seven years. By contrast, July precipitation for the Southeast region is shown below. The Southeast region recorded their 17th driest July on record and was the driest region overall for July 1992.

SOUTHEAST REGION PRECIPITATION
JULY, 1895-1992

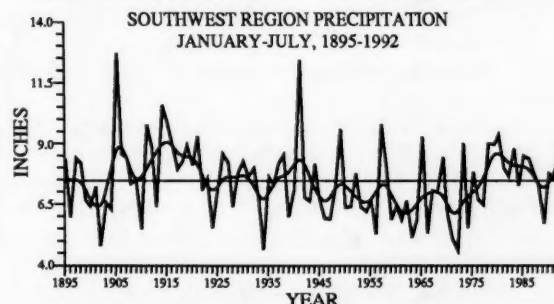


Year-to-date precipitation for the Northwest region is shown in the next graph below. Collectively, Washington, Oregon, and Idaho are reporting their 12th driest such period on record. At the other extreme, the last graph below shows that the Southwest region recorded its 11th wettest January through July period on record.

NORTHWEST REGION PRECIPITATION
JANUARY-JULY, 1895-1992



SOUTHWEST REGION PRECIPITATION
JANUARY-JULY, 1895-1992



July temperature for the East North Central region was the coolest (by 1.5 °F) on record and the third July in as many years where the average temperature was below the mean. The Northeast and West North central regions also noted some cooler than normal temperatures. It was the second coolest July since records began, in 1895, for each of these two regions. Within the last five years, the Northeast region has recorded average July temperatures ranking them within the top ten warmest and now, one of the coolest.

The West region had their third warmest January through July period on record continuing an above normal trend lasting eight of the last nine years. 1992 year-to-date temperature for the Northwest region is logged as the second warmest such period on record. The Northeast region is the only region for the year-to-date that is located within the lower third of the historical distribution for temperature with a ranking of 31st coolest. Growing season precipitation for the Primary Corn and Soybean agricultural belt for

(From *Climate Variations Bulletin*, National Climatic Data Center, NOAA)

March-July 1992 ranked as the 54th wettest such period on record for this region and places the July average only fractionally above the long term mean.

According to preliminary data from the National Weather Service, there were 199 tornadoes across the United States in July 1992, which is a record for July, (the old record was 163 in 1987) and compares to the 1953-1991 average of 84. The July tornado

count is shown as the bottom bar in the figure on Page 20. The year-to-date total of 892 is above the long-term average of 595 and is shown as the combination of both the bottom and top bars in the figure on Page 20. It should be noted that the preliminary tornado count is generally higher than the final count. For example, the preliminary annual counts for 1990 and 1991 were about 20 percent higher than the final annual counts for those two years.

Climate Regions Used by National Climatic Data Center



(From *Climate Variations Bulletin*, National Climatic Data Center, NOAA)

JULY WEATHER SUMMARY

Drought broke dramatically across the Corn Belt during July, and although it remained cooler than normal, temperatures were high enough to help turn the Nation's corn crop condition from 52 percent good to excellent on July 5 to 79 percent good to excellent by August 2. Soybean, grain sorghum, and spring wheat crops also enjoyed ample July showers without excessive heat. Monthly precipitation topped 150 percent of normal in an arc through the Northern and Central States. Pockets of heavy rain also covered parts of Texas and the Southeast. Widespread dryness was confined to the Red River Valley and the South Atlantic States, as well as the dry-season Western States.

Temperature departures were remarkable for a summer month in the North Central States. In fact, temperatures averaged 9 °F below normal at several stations in Nebraska and South Dakota, which was the greatest negative departure for July in the contiguous United States since similar values were recorded in southern Texas 16 years ago. And not since 1958 had a July sported a combination of cool weather in the North Central States and wet weather from the east-central Plains to the eastern Great Lakes, along with an acute fire danger (hot and dry) in the Western States.

Early in the month, a strong upper level ridge built across the Southern States, allowing 100 °F heat to creep as far north as the west-central Plains and the Middle Atlantic States. A series of cold fronts from central Canada took their toll on the ridge, squashing it by mid-month, but not before Pueblo, CO, hit 104 °F on the 6th, and Norfolk, VA, reached 101 °F on the 12th and 14th. But the fronts

served to keep the North Central States cool, as Sault Sainte Marie, MI, topped 70 °F for the first time in 19 days on July 7. Part of the crushed ridge rebounded over the Western States, leaving areas east of the Rockies unprotected from thunderstorm-laden Canadian cold fronts. Hit-or-miss harbinger rains dampened the Corn Belt and the east-central Plains early in the month, but became widespread after the 9th. July rainfall records began to fall by mid-month, and Columbus, OH, set an all-time 24-hour record with more than 5 inches on the 13th. By the time July ended, Kansas City, MO, had endured its wettest July (15.47 inches), topping the record set in 1958 (10.70 inches), and its second wettest month ever, behind September 1914 (16.14 inches). Columbus, Akron, and Mansfield, OH, along with Moline, IL, also set July rainfall records and received more than 10 inches of rain.

After each successive cold front pushed into the Southeast, Canadian-origin air blanketed the Northern and Central States. Crop development, already behind schedule due to cool, dry weather in May and June, remained up to 2 weeks behind schedule in the northern and western Corn Belt by month's end. Temperatures twice failed to top 60 °F in Dubuque, IA (on the 23rd and the 30th), and the average maximum temperature was only 74.5 °F in Sioux Falls, SD, a record, and more than 10 °F below normal. But on the other side of the Continental Divide, hot, dry weather after mid-month invited wildfire development. At the end of July, major fires scorched trees and brush west of Yosemite National Park, CA, in south-central Oregon, and in west-central Idaho.

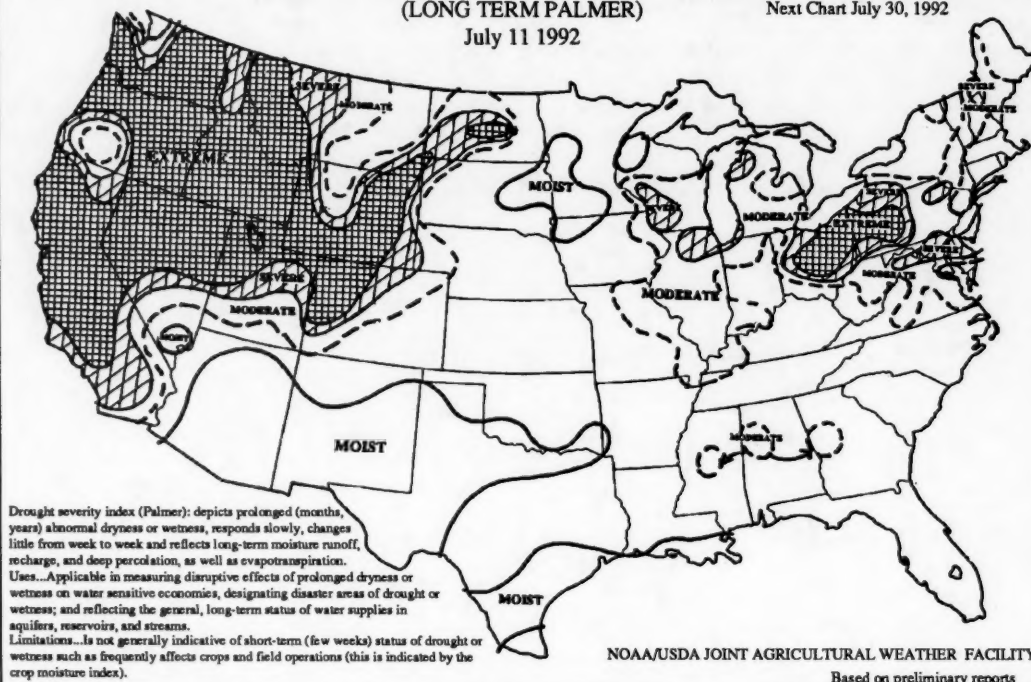
(From *Weekly Weather and Crop Bulletin*, NOAA/USDA Joint Agricultural Weather Facility)

DROUGHT SEVERITY

(LONG TERM PALMER)

July 11 1992

Next Chart July 30, 1992

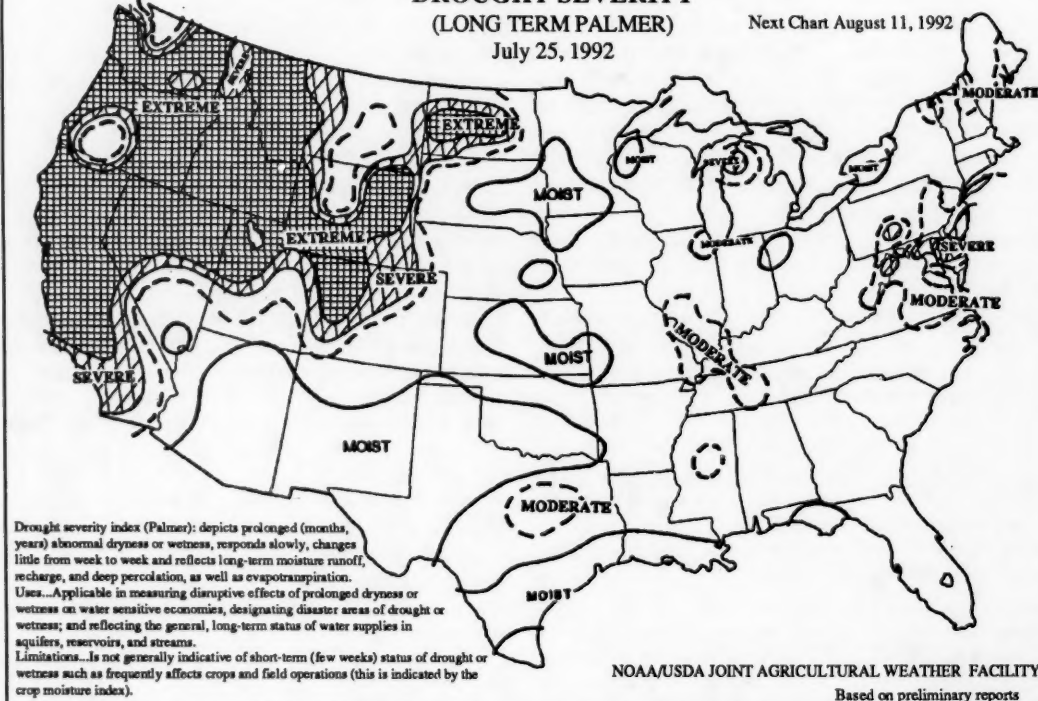


DROUGHT SEVERITY

(LONG TERM PALMER)

July 25, 1992

Next Chart August 11, 1992



(From Weekly Weather and Crop Bulletin, NOAA/USDA Joint Agricultural Weather Facility)

TEMPERATURE OUTLOOK FOR JULY-SEPTEMBER 1992



PRECIPITATION OUTLOOK FOR JULY-SEPTEMBER 1992

OUTLOOK

- / Likely above median
 □ About equal chances
 ▒ Likely below median



From *Monthly and Seasonal Weather Outlook* prepared and published by the National Weather Service

NATIONAL WATER CONDITIONS

JULY 1992

Based on reports from the Canadian and U.S. Field offices; completed September 28, 1992

TECHNICAL STAFF

Thomas G. Ross, Editor
Krishnaveni V. Sarma
Judy D. Fretwell

COPY PREPARATION

Thomas G. Ross
Krishnaveni V. Sarma
Kristina L. Herzog
Carol Harrison

GRAPHICS

Thomas G. Ross
Krishnaveni V. Sarma
Brandon W. Bowers
Kristina L. Herzog
Carol Harrison

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EXPLANATION OF DATA (Revised December 1990)

Cover map shows generalized pattern of streamflow for the month based on provisional data from 186 index gaging stations—18 in Canada, 166 in the United States, and 2 in the Commonwealth of Puerto Rico. Alaska, Hawaii, and Puerto Rico inset maps show streamflow only at the index gaging stations that are located near the point shown by the arrows. Classifications on map are based on comparison of streamflow for the current month at each index station with the flow for the same month in the 30-year reference period, 1951-80. Shorter reference periods are used for one Canadian index station, two Kansas index stations, and the Puerto Rico index stations because of the limited records available.

The **streamflow ranges map** shows where streamflow has persisted in the above- or below-normal range from last month to this month and also where streamflow is in the above- or below-normal range this month after being in a different range last month. Three **pie charts** show: the percent of stations reporting discharges in each flow range for both the conterminous United States and southern Canada, and also the percent of area in each flow range for the conterminous United States and southern Canada. The **combination bar/line graph** shows the percent departure of the total mean from the total median flow (1951-80) and the cumulative departure from median (in cfs) for all reporting stations (excluding eight large river stations indicated by # in the *Flow of large rivers* table) in the conterminous United States and southern Canada.

The comparative data are obtained by ranking the 30 flows for each month of the reference period in order of decreasing magnitude—the highest flow is given a ranking of 1 and the lowest flow is given a ranking of 30. Quartiles (25-percent points) are computed by averaging the 7th and 8th highest flows (upper quartile), 15th and 16th highest flows (middle quartile and median), and the 23rd and 24th highest flows (lower quartile). The upper and lower quartiles set off the highest and lowest 25 percent of flows, respectively, for the reference period. The median (middle quartile) is the middle value by definition. For the reference period, 50 percent of the flows are greater than the median, 50 percent are less than the median, 50 percent are between the upper and lower quartiles (in the normal range), 25 percent are greater than the upper quartile (above normal), and 25 percent are less than the lower quartile (below normal). Flow for the current month is then classified as: in the **above-normal range** if it is greater than the upper quartile, in the **normal range** if it is between the upper and lower quartiles, and in the **below-normal range** if it is less than the lower quartile. Change in flow from the previous month to the current month is classified as **seasonal** if the change is in the same direction as the change in the median. If the change is in the opposite direction of the change in the median, the change is classified as **contraseasonal** (opposite to the seasonal change). For example: at a particular index station, the January median is greater than the December median; if flow for the current January increased from December (the previous month), the increase is seasonal; if flow for the current January decreased from December, the decrease is contraseasonal.

Flood frequency analyses define the relation of flood peak magnitude to probability of occurrence or recurrence interval. **Probability of occurrence** is the chance that a given flood magnitude will be exceeded in any one year. **Recurrence interval** is the reciprocal of probability of occurrence and is the average number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. **Recurrence intervals imply no regularity of occurrence**; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about **ground-water levels** refer to conditions near the end of the month. The water level in each observation well is compared with average level for the end of the month determined from the entire period of record for that well. **Changes in ground-water levels**, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data are given for five stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). **Dissolved solids** are minerals dissolved in water and usually consist predominately of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. **Dissolved-solids discharge** represents the total daily amount of dissolved minerals carried by the stream. **Dissolved-solids concentrations** are generally higher during periods of low streamflow, but the highest dissolved-solids discharges occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at times of low flow.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
419 NATIONAL CENTER
RESTON VA 22092

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